MODERN ACHIEVEMENTS

IN SCIENCE, INVENTION
COMMERCE AND HISTORY

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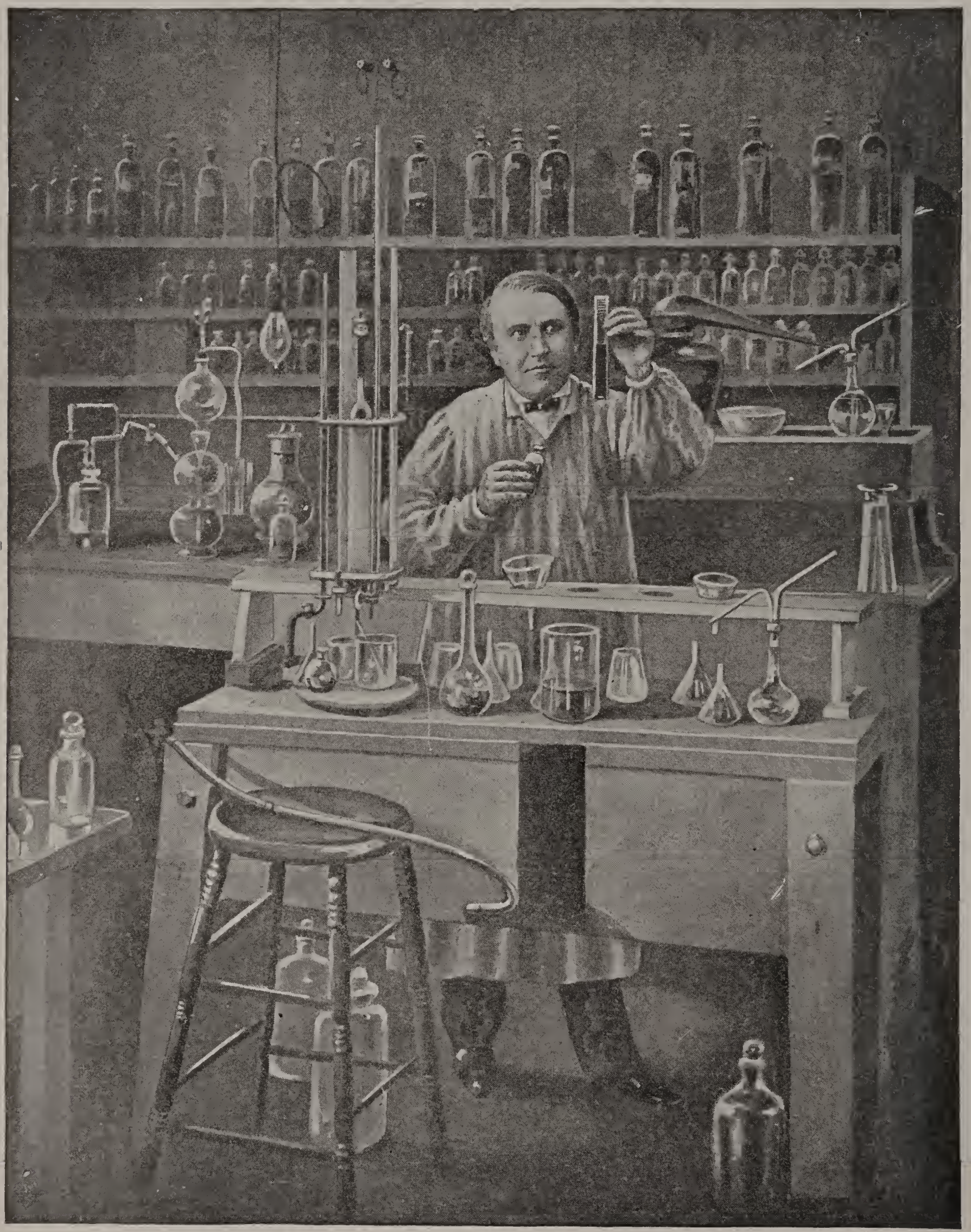
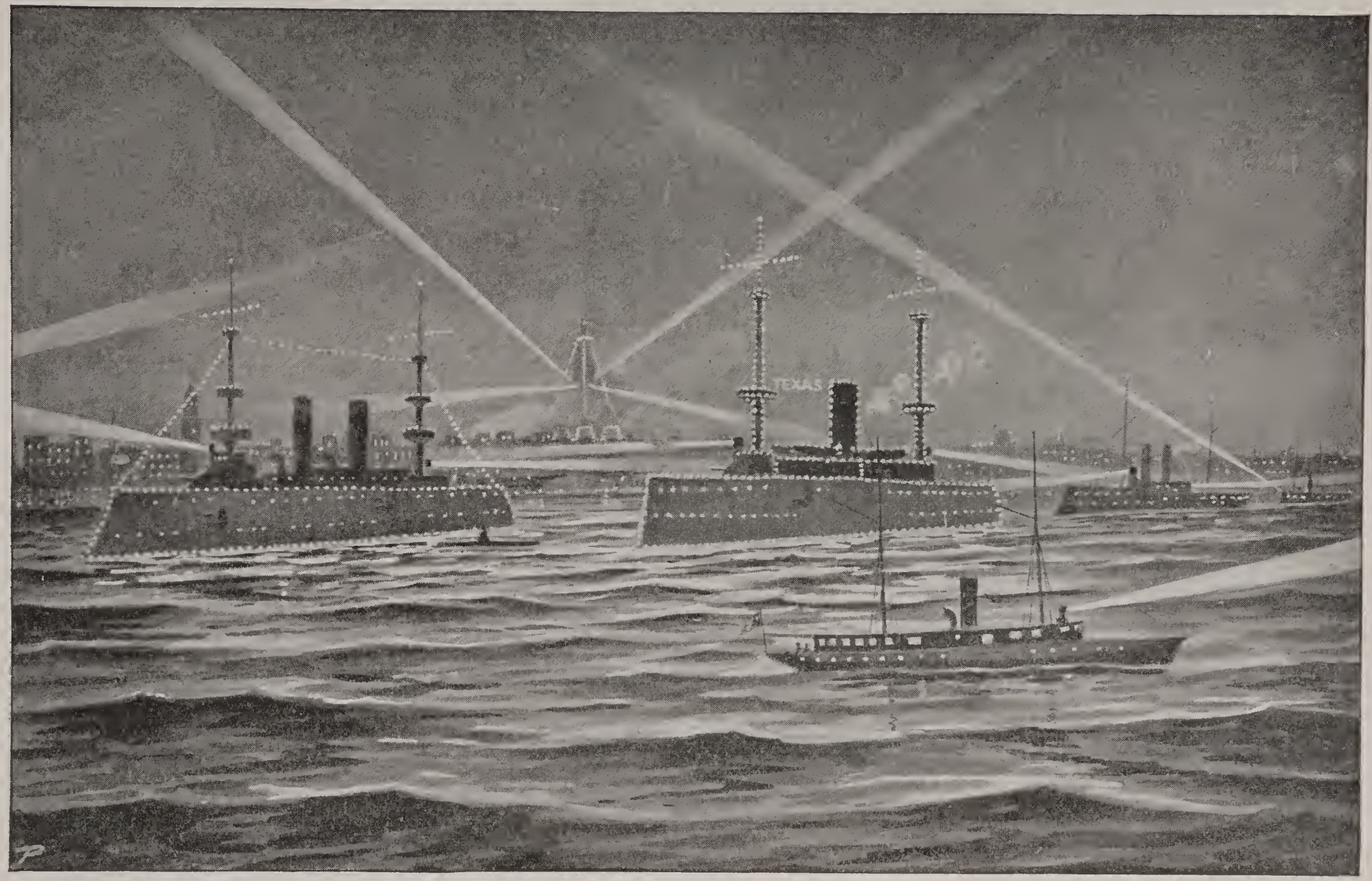


THOMAS A. EDISON IN HIS LABORATORY.



GREAT NAVAL DEMONSTRATION IN PHILADELPHIA DURING THE PEACE JUBILEE

A STRIKING EFFECT WAS PRODUCED BY SEARCHLIGHTS ON THE WAR VESSELS AND ON THE CITY HALL

THE BALLOON USED IN MODERN WARFARE

THE WORLD'S GREAT INVENTORS AND DISCOVERERS

MODERN ACHIEVEMENTS

IN

SCIENCE, INVENTION, COMMERCE AND HISTORY

CONTAINING

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PREFACE.

OUR grandparents were wont to tell us of the awe and skepticism that everyone expressed when, during the last century, steam was first used as a motive power, and by means of electricity the first message was flashed over Morse's telegraph. But the era of marvelous discovery and invention, of stupendous enterprises and fabulous fortunes was, as it were, yet in its infancy. To-day we are on the threshold of a new epoch: we have ushered out the wonderful Nineteenth Century, and words fail us when we think what new marvels are yet to be brought forth from bounteous nature by the aid of the hand and brain of Man.

Sufficiently awe-inspiring is it to gaze about us at the inventions of the last twenty years and understand in what a grand and glorious age we are living. History tells us of the Golden Age of Greece, of the fabulous wealth of the Orient, of the marvels of the armies of Xerxes and of Cæsar, of the brilliancy of the all-absorbing Roman Empire, and of the later years when Shakespeare lived, and artists, poets, and wise men were aided by rich gifts from Kings and Queens and encouraged in their search for wisdom.

The discovery of America was a wonderful history maker, and accomplished almost in a day what years of careful study could not have proved. But what are we to say of this, the most marvelous country of them all?

To-day we have so subdued nature that we have harnessed the great Niagara, and hourly convert by means of great turbines many thousands of volts of electricity to be used in aiding the ways of commerce. By means of the weirdest of all discoveries,—the X Rays,—we can now gaze in contemplation on the beatings of the human heart, secure within its fortress of muscle and ribs.

Air has been reduced to liquid substance, so cold that mercury when brought in contact with it is frozen solid as rock. The wizards of electricity are at work perfecting the wonderful wireless telegraph, and means of transmitting electrical power for light without wires is expected soon to be achieved. To-day we are able to photograph moving objects, and reproduce them life-like in form and size and graceful motion.

Such are some of the wonders wrought within recent years; we dare not scoff at what the future may bring forth. What we should do, however, is to keep abreast of the times,—to know of the age in which we live. And it is no

easy task, when one must glean from this newspaper and from that magazine, and catch fragmentary pieces of a subject here and there and try to retain them in this busy hustling and bustling life long enough to gain a fair understanding and form opinions of them.

With this thought in view the publishers of this magnificent volume have spared no expense to present to the intelligent reading public a comprehensive and thoroughly up-to-date encyclopædia of the latest inventions and improvements in the scientific and mechanical world; the work is primarily intended for busy people who desire facts, yet who wish to be spared the labor of long and unsatisfactory researches through libraries, museums, and histories.

In the space alloted to science in this delightful book are described the latest marvels: liquid air, the wireless telegraph, the new uses of the X Ray, the advance in experiments toward the perfect air ship, telegraphing pictures, and many other wonderful feats never before dreamed of.

Then follows a number of very interesting accounts of inventions along the mechanical line, though many partake of the nature of the scientific. Here the reader learns that the dreams of Jules Verne have come true, and that man may now safely travel the bottom of the sea. Besides submarine boats, there are here treated such subjects as battleships and modern war engines, moving pictures, great engineering feats, automobiles, bridges, canals, monster printing presses, type-setting machines, iron and steel mills and foundries and stereotyping processes. The modern tall building or "sky scraper" is described in its various stages of construction.

And after these history making machines comes some of the history they have changed. Here are to be read and seen portrayed in picture the travels and discoveries of the wise men of the world; the acquisition of the new territory of the United States: Porto Rico, Hawaii and the Philippines; the great Peace Conference, called by the Czar of all the Russias; the war in South Africa, our marvelous growth in commerce and shipping, the cattle industry, and the stock yards at Chicago. Here we shall learn how great newspapers are made and circulated, and how trusts are organized.

Many young men and women are embarrassed by responsibilities they cannot throw off. He or she may not be able to attend college or go to the great cities for learning; but no one need be ignorant with such mines of information as this book lays before them. Indeed, they who will not learn may go their poor deluded ways; but those who are struggling upward and onward, striving to learn and to know, to gain knowledge, and with knowledge power, will find in the following pages a way open for higher, better and nobler achievements.

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EDUCATION

The Training of Mind and Body

AMONG the wise and pithy sayings of one of our best known modern writers is this: If a man empties his purse into his head, no man can take it away from him. An investment in knowledge always pays the best interest.

It is by diligent attention to this rule that the highest success is gained. It is impossible to have the noblest type of man, physically, intellectually or morally, without education. An uneducated ploughboy cannot reach the commanding heights of the widest influence; with education he may rise to the highest position his country can bestow.

The biographies of the greatest statesmen, scholars, men of letters, philosophers and others who have gained distinction, invaribly represent them as possessed of an eager thirst for knowledge. Sir Isaac Newton was in the habit of spending whole nights in the study of astronomy and the laws that govern the heavenly bodies. Without such close application he could not have made those immortal discoveries which have been the wonder of all thoughtful minds from his time until the present.

It is the observation of one of our modern writers that a human being is not, in any proper sense, a human being until he is educated. Thus his slumbering faculties are aroused. The magnificent displays of knowledge dawn upon him as the morning light brings beauty and fruitfulness to the earth. The word education means to train, to instruct, to awaken our faculties to action; or, taking the word in its primary sense, it means "to draw out." It aims at the growth and highest possible culture of the whole man, and the most valuable means for securing this grand result are found in books of useful knowledge and information. These are the tools with which the rough block is chiselled into symmetry and beauty.

The fruits of the earth do not more obviously require labor and cultivation to prepare them for our use and subsistence, than our faculties demand instruction and regulation in order to qualify us to become upright and valuable members of society, useful to others, or happy in ourselves. We must be disciplined and trained.

Education is a friend which no misfortune can estrange; a companion that never becomes wearisome; a light that never grows dim; a solace that never fails. It is the helper of the poor and unfortunate, the handmaid of genius, an introduction abroad, and an ornament in every walk of society. Without it, what is man—what can be but an untutored savage?

What sculpture is to a block of marble, education is to the mind. The philosopher, the saint, the hero, the wise, the good, the great, often lie hidden and concealed in some unnoticed individual, which a proper education might have disinterred and brought to light.

The True Motto.

Education begins with life. Before we are aware the foundatioms of the future structure are laid. Busy pursuits, the struggle for daily bread, and the toil that cannot be escaped, crowd out the opportunity to engage in the pursuit of knowledge, but if we take the correct view of this most important matter, we shall hold that education is never finished, that there is always something new to learn, that the highest summit has not been reached, and we shall still, in the spirit of Longfellow's "Excelsior," press upward with a noble resolve, and a determination that is daunted by no difficulty or failure.

Too apt are we to take a narrow, limited view of self-training. One boy is educated to be a bookkeeper; another, to be a draughtsman; another, to be a stenographer; another, to be an electrician; another, to be a lawyer or journalist. It is true that special training is needed for special pursuits, and no less true that the whole man needs to be educated, whatever may be the subsequent calling to be followed. All other training is like lopping off the branches on one side of the tree and causing them to grow only on the other side—very good branches, perhaps, but a very misshapen tree.

Hear what Daniel Webster said: Knowledge does not comprise all which is contained in the large term of education. The feelings are to be disciplined; the passions are to be restrained; true and worthy motives are to be inspired; a profound religious feeling is to be instilled, and pure morality inculcated under all circumstances. All this is comprised in education.

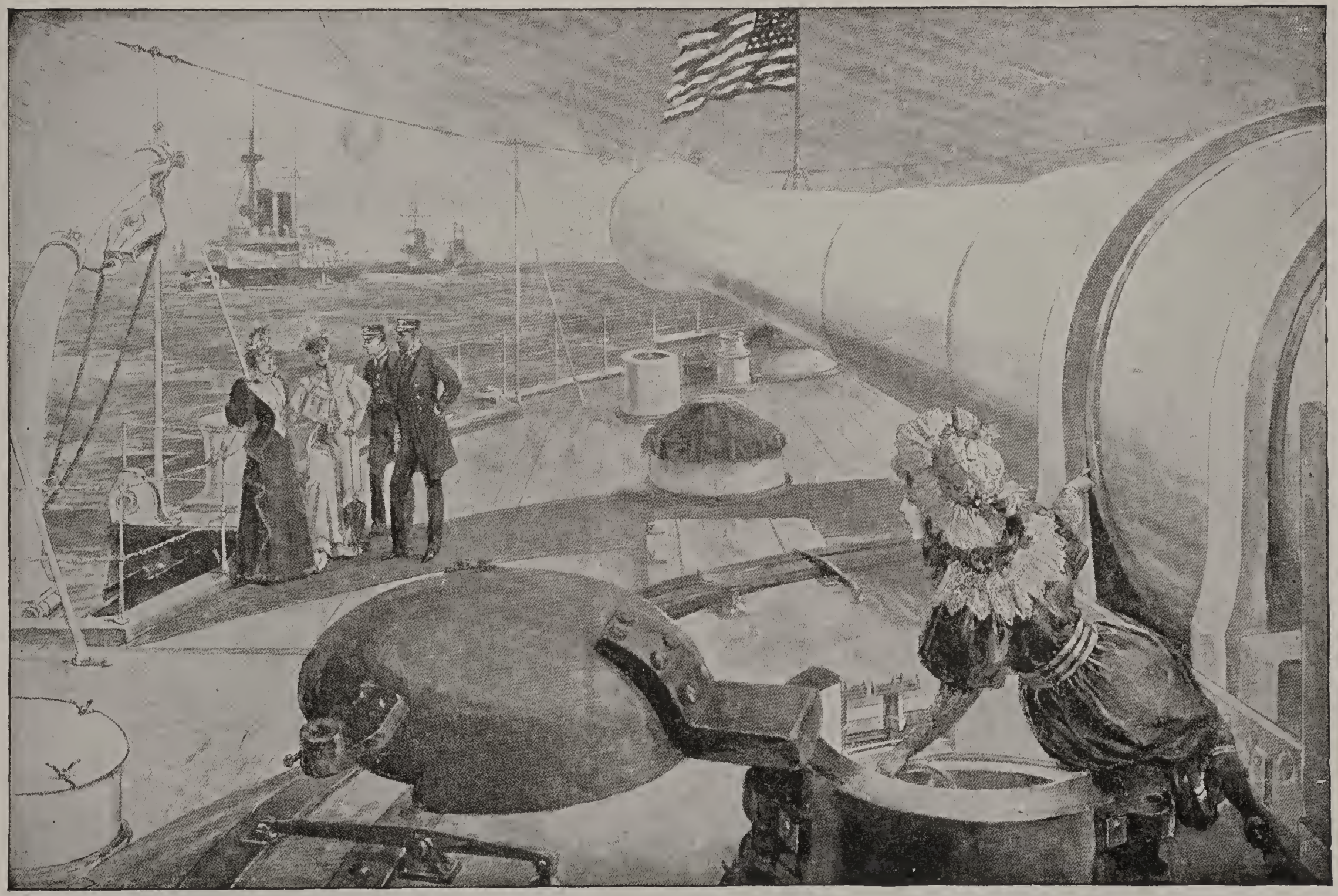
Said Washington—and our entire history since his day has proved the sagacity of his remark: Promote, as an object of primary importance, institutions for the general diffusion of knowledge. In proportion as the structure of a government gives force to public opinion, it is essential that public opinion should be enlightened. The Father of his Country was firm in the conviction that ignorance should have no place among a free people.

An Old Legend.

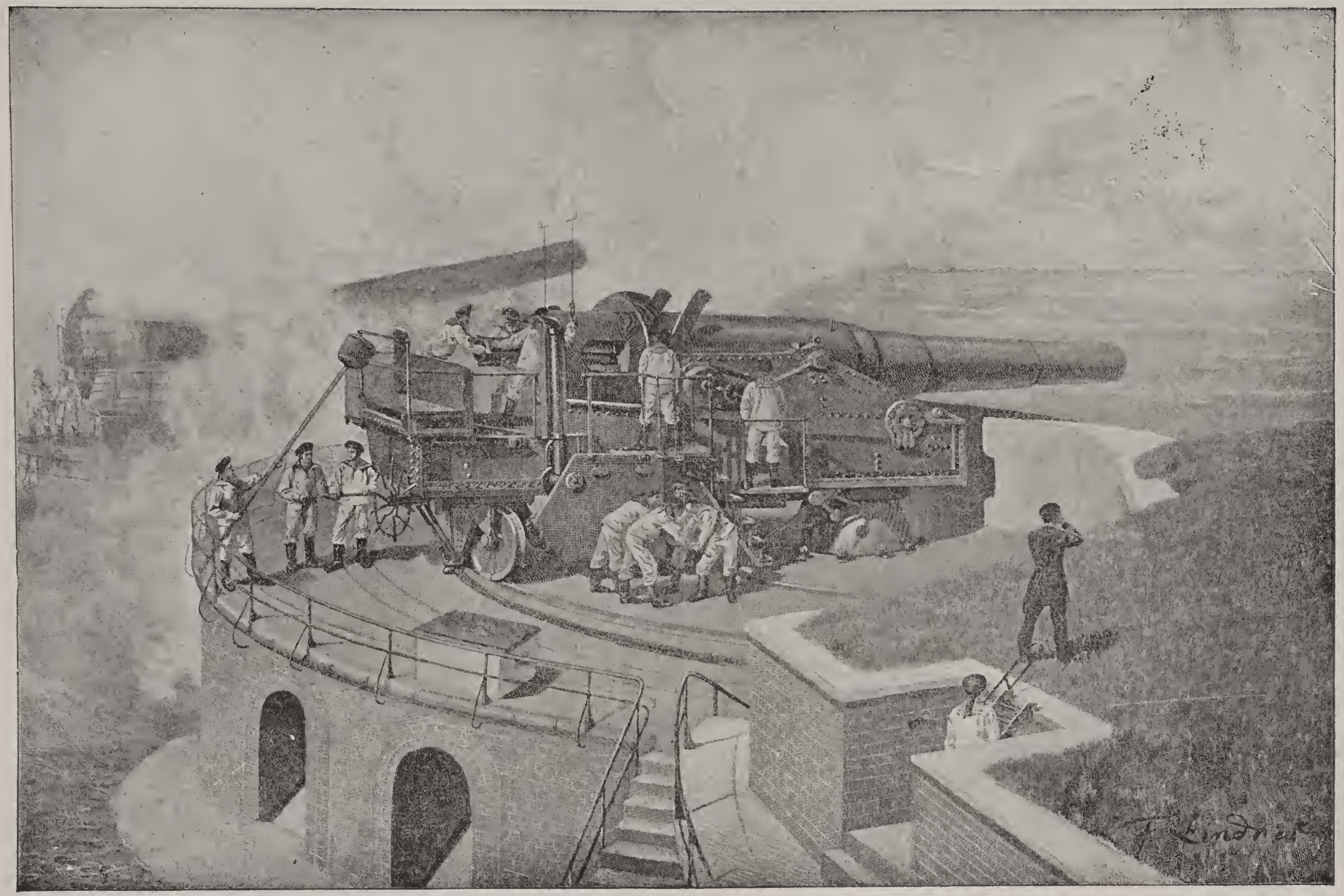
There is an old fable in classical Mythology which pictures Hydra as a serpent crawling in the slime of marshy Lerna—a monster with many heads, anyone of which, if cut off, was replaced by two others unless the wound was cauterized. The horrid creature was slain by Hercules; this was one of the giant's famous achievements. No less true is it that ignorance is a hydra with a thousand heads, ugly, dangerous, demonish, and the Hercules that alone can slay it is that knowledge which comes from enlightened education.

One of our martyred Presidents said: Next in importance to freedom and justice is popular education, without which neither freedom nor justice can be maintained. This means that more than banks, railroads, factories, commercial structures thirteen stories

THE AUTOMOBILE IN WAR—RAPID-FIRE GUNS USED BY THE ENGLISH TROOPS AT THE DEFENCE OF LADYSMITH



VISITORS ON BOARD A MAN-OF-WAR—A LITTLE CHILD MOVES A GUN WEIGHING 67 TONS



REVOLVING GUN USED FOR COAST DEFENCE

STUDENTS OF PRACTICAL DESIGN AT WORK—SCHOOL OF INDUSTRIAL ART, BOSTON

high —more than all the sails of commerce and all the ploughs that turn up golden harvests from prairies, is that thorough training which fits the citizens of a free commonwealth for their duties and responsibilities.

William Penn, writing to his wife concerning their children, said: For their learning be liberal. Spare no cost; for by such parsimony all is lost that is saved; but let it be useful knowledge, such as is consistent with truth and godliness, not cherishing a vain conversation or idle mind; ingenuity, mixed with industry, is good for the body and the mind, too.

Thus, have the fathers and founders of our nation urged, insisted upon, and demanded, all the advantages of a liberal education. fortunately, these have been provided for all.

SELF CULTURE

NO one will deny that a large and very important part of mental and physical training is furnished by parents and teachers. Their influence is vast and far-reaching. If it were not so, if the school-master and professor had no hand in forming mind and character, the doors of our schools and academies might as well be shut and nailed up.

As wrapt and hidden in the stone's embrace
  The future statue lies yet undefined;
  Till the nice chisel clears the form designed,
The trunk, the moving limbs, the speaking face
Develops: so instruction's hand must trace
  The intellectual form, which lies enshrined
  'Mid nature's rude materials; and the mind
Invest with due proportion, strength and grace.
God, to thy teaching, delegates the art
  To form the future man: the care be thine,
No shape unworthy from the marble start,
  Reptile or monster; but with just design
Copy the heavenly model, and impart,
  As best thou canst, similitude divine.

But what can others do for us compared with what we can do for ourselves? Books are our teachers and the printer's type rules the world.

Very justly it has been said by a recent writer: We all have two educations, one from others, and another which we give ourselves. It is this last education which determines our standing in society, and our actual condition in life, and our fate hereafter. All the professors and teachers in the world would not make you a wise or good man without your own co-operation; and if such you are determined to be, the want of them will not cause you to fail. We are to make the most of ourselves. It should be the duty of education to make men first and noble deeds will follow.

The educated man is the one who wears the crown—the man who can learn from reading and observation and then apply what he knows. Every manufacturer, and every other employer, knows the vast differ

ence between an educated and uneducated workman. Two men come, soliciting work. One is boorish in appearance, ungrammatical in speech, dull in comprehension because his faculties have never been sharpened; he seems to be little less than a machine and with scarcely more comprehension. The other is bright, quick, speaks correctly, gives evidence of self-training and capacity. By his side the other presents a pitiable spectacle, and in the competition is distanced, as a trained sprinter outstrips a man on wooden legs. This is something occurring around us every day and within the commonest observation.

Great Value of Ready Information.

In all education a knowledge of men and things is indispensable. For this reason the cultured classes of Europe, and to some extent of our own country, have considered it essential for the boy or girl who has passed through the schoolroom and mastered the course of study, to seek information from other sources; to take a trip through the outside world and lay in a fund of such knowledge as can be obtained only by observing the daily doings of ordinary life and the people who are the actors in events of constant occurrence. The eye is the prime teacher. Open it and keep it open. Look, examine, ask questions, and do not be ashamed to ask.

Knock on the lids of books, packed with useful information, and say, "I am here to learn what you have to tell me. We are to become well acquainted; I am going to keep company with you; teach me, surprise me, store my mind with knowledge; unfold your secrets; let me into the sanctum; I have come to stay, and mean to traverse your charming pages until they are worn to a beaten path."

Say this to your books of thought, of knowledge, of all practical information. We say practical, for there is much that you do not need to know, and would not make you wiser if you did know. Common sense is the most uncommon, but it is the best. What will be useful for everyday life, teaching you how to think, to feel, to act, to succeed, to make the most of yourself, to step up higher and higher on the ladder of fame and fortune—this is what your book should teach.

Gold Must be Refined.

There is sure to come a time when those who have neglected self-culture in early life see the great mistake they have made; they regret it when perhaps it is too late. Although they are conscious of their own defects, their ignorance and sad lack of education, they have not time and opportunity to apply the remedy. You should, therefore, make the most of your advantages while you have them.

Very bright minds may remain in eclipse for want of cultivation. The diamond is not allowed to continue in its rough state; it must be cut and polished. Gold must be separated from the rude ore; it is of small account until this is done. Cicero says, cultivation to the mind is as necessary as food to the body. Soil uncultivated may produce the most luxuriant weeds, yet only weeds; it must be plowed, hoed, harrowed before it will produce good fruit.

Chesterfield said: I am very sure that any man of common understanding may, by culture, care, attention and labor, make himself whatever he pleases, except a great poet. This is only a part of the testimony that is given by the great minds of all ages, affirming that close application and rigorous discipline are essential to the highest attainments and the most brilliant success.

LIQUID AIR.

THE COLDEST SUBSTANCE KNOWN TO MAN. THE MOST MARVELOUS DISCOVERY IN THE REALM OF SCIENCE.

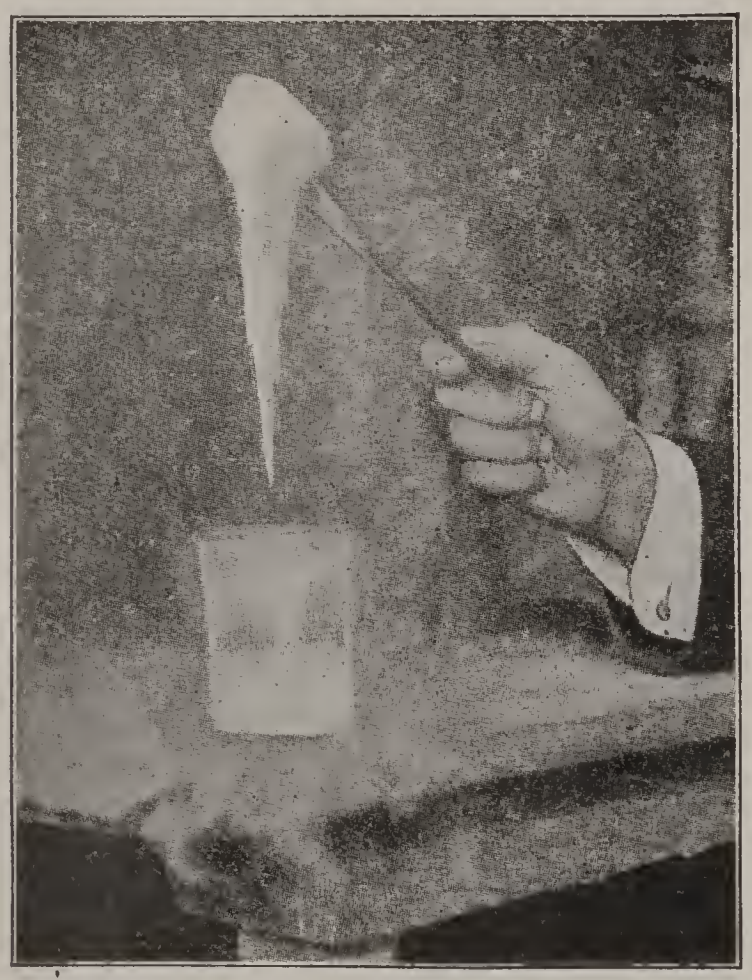
ONE of the most interesting discoveries in the realm of science in late years has been that of liquid air. It was long ago observed that when a gas was compressed so as greatly to reduce its volume, it became hot. This was called the heat of compression, and, strangely enough, was thought to be generated by the act of compression. It is now understood, however, that the rise in temperature is not caused by an increase in heat, but rather by the concentration of the manifest heat of a large volume into a small space. Experiments that proved this also suggested that the discovery could be turned to profit by cooling the heated gas down while under pressure, and then allowing it again to expand to its original volume, which would make it fall greatly in temperature. It was soon learned that gas could be compressed and then cooled and allowed to expand until its temperature dropped 200 degrees.

For some time it had been held by scientists that air was a permanent gas, and could not be changed in its form, but gradually with experiments the idea arose that if air could be brought to a sufficiently low temperature it could be liquefied. All means known were used without success until, in 1877, *Raoul Pictet* submitted oxygen gas to an enormous pressure combined with intense cold. The result was a few drops of clear, bluish liquid that bubbled violently for a few moments, and then evaporated into the air again. In 1892, a Polander named Olzewski succeeded in performing a similar experiment with nitrogen, the other constituent of air. And about the same time Professor Dewar, of England, not only performed both of these experiments, but also succeeded in producing a small quantity of air in a mushy form—in fact, air-ice.

The Cost

of this first ounce of liquid air was more than $3,000. While being a very interesting discovery for laboratory use, such a production and at such an expense was out of the question for commercial purposes. So it remained for Charles E. Tripler, of New York City, to invent a method whereby this wonderful agent can be brought forth with ease and at the cost of about 20 cents a gallon. He saw at once, upon the discovery that air could be liquefied, that it might be a great power generator, and accordingly commenced experiments to simplify the method for procuring it. He investigated the various means by which refrigeration was developed, such as the immense ammonia plants used in breweries and the like. The principle of cooling by expansion, he learned, was the basis to work upon, and the result of his studies was the following system:

At present a fifty-horse power plant operating an air compressor, and a barrel-like arrangement about fifteen feet high, full of small pipes and valves, and protected by wrappings so as to keep out the heat, are the machines by means of which this new discovery is brought forth. Tripler uses compressed air to cool the other air that he is liquefying. Under the very principle that expanding air grows cooler, if he could so arrange his



ALCOHOL FROZEN IN A GLASS OF LIQUID AIR.

apparatus that air which was rapidly growing cooler could pass about pipes containing his working material, he would have his problem solved. And so it is.

Air under a pressure of 2,500 pounds to the square inch, and cooled to about 50 degrees Fahrenheit by being passed in pipes through a bath of running water while thus compressed, is carried through coils of pipe to the large felt-and-canvas-covered tube or receiver spoken of. Two sets of pipes lead from the compressor to the receiver: one contains the air to be liquefied, the other the air that does the work of liquefying, but both are under the same heavy pressure. By turning a tap in the receiver, the air that does the work rushes forth and up the sides and around the pipes in the chimney-like space of the receiver. This reduces the pressure, and since air in expanding takes up heat wherever it can be found, the air confined in the pipes is cooled. As the released air now grows warmer and climbs to the top of the receiver, it gradually returns to the compressor. Here it is again brought under pressure and cooled again, only to be released once more in the receiver to lick up more warmth from the air in the pipes. Since the temperature of the air under treatment is going down in jumps of 100 degrees every time it is treated to this chilling process, it takes but about fifteen minutes till a tap at the bottom may be turned, and drops of liquid air at the temperature of 312 degrees below zero drip out from the pipes in the receiver. These at once evaporate in great billowy clouds of vapor.

But it is not intended that such an operation shall be devoid of results, so devices have been invented for holding the air after its production. One of these receptacles is the

Dewar Bulb.

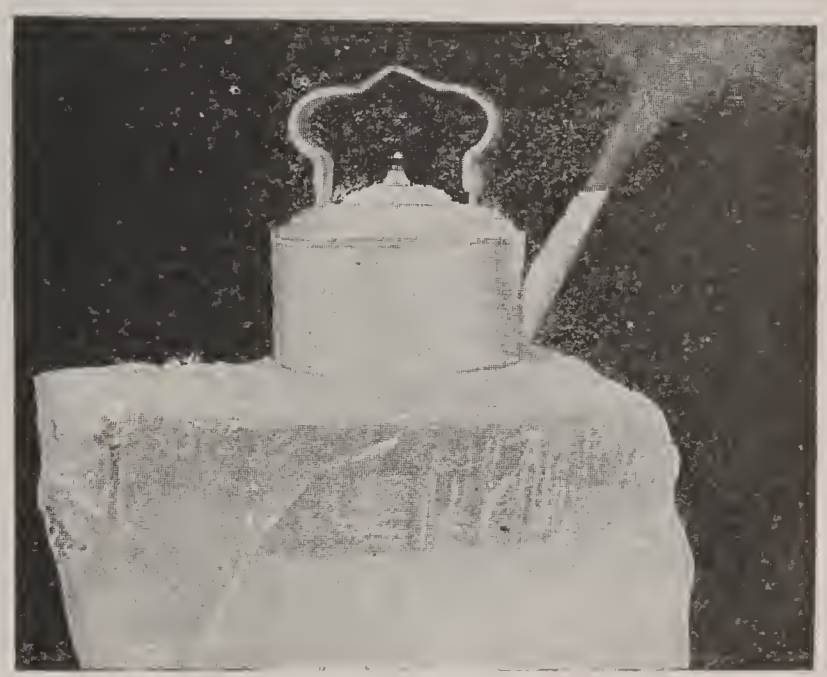
It consists of two vessels of glass, one within the other, having a high vacuum between the walls, and joined in a common neck at the top. The vacuum prevents the passage of heat, so that the evaporation of the liquid in the inner tube is reduced to a minimum. The neck of the bulb is left open, for liquid air is of such an expanding nature that it would otherwise explode. The cold, heavy mist of evaporation that is always present at the mouth of the bulb acts, however, as a

shield to some extent. Lately, Dewar tried putting a few drops of mercury between the walls of the two bottles, with the result that in a vacuum the mercury vaporized and spread itself over the walls of the bottles. This acted as a mirror, and still more effectually kept out the heat. Tripler has arranged a set of cans of similar nature, which are covered with felt and canvas so that the liquid air may be shipped. The mouth of the can is also covered with felt, but this is safe, as it allows the gases to escape somewhat. Air thus packed loses less than one-third in a nine hours' ride.

The Uses and Experiments

to which this wonderful discovery may be placed are as odd and interesting as the method of its production. The following are a few of its uses:

It is eleven and one-half times as powerful as compressed air, and may be carried in a pasteboard box, while as much energy in compressed air would need the strongest steel cans. It may supplant some forms of fuel, for, when mixed with any form of carbon, it burns rapidly or explodes. Thus it may be used in interior combustion engines—for instance, the gas engine. When a proper motor has been developed, it will no doubt be used to help solve the question of aërial navigation, for something that combines great power with lightness seems to be the only reason why air-ships are not a complete reality. The same may be said of submarine navigation. Here liquid air would supply the motive power, and the air for the crew to breathe as well, for a small quantity contains as much air as can be compressed into many great tanks. An automobile is now being made to run by this power. Deep-sea diving would also be aided by the use of casks of this air attached to the diving apparatus of the diver, thus doing away in a great measure with the pumps. In mines where water is likely to rush in at any time, it might be used to freeze the surrounding earth, thus preventing great catastrophes. In making such vacuum bulbs as those used for electric lights, liquid air would be very useful. After the air has been pumped out as much as possible, the remainder can be frozen into a solid drop at one



LIQUID AIR BOILING ON A BLOCK OF ICE.

The temperature of Liquid Air being 312° below zero and the Ice 32° above, the latter is like a furnace in comparison.

end, and then the bulb may be closed above it by an ordinary blow-pipe, thus giving an absolute vacuum. The most frightful explosives can be produced with the combination of combustibles and liquid air, for oxygen is necessary to combustion, and this air contains it in vast quantities. Of late months, physicians and surgeons are singing the praises of this discovery, for by its aid a wound may be cauterized, or an excrescence "burned" away entirely. Odd experiments, such as freezing a rose in all its color and loveliness, or reducing an egg to a frozen solid that when handled will break up into a thousand fragments and the yolk scatter as the pollen of a flower show what may be done in the laboratory

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PROF. CHARLES E. TRIPLER

HE IS TO LIQUID AIR WHAT EDISON IS TO ELECTRICITY. THIS NEW AND GREAT DISCOVERY IS DESTINED TO REVOLUTIONIZE EVERYTHING PERTAINING TO THE SUPPLY OF MOTIVE POWER FOR TRANSPORTATION, MACHINERY, REFRIGERATION, MANUFACTURE OF POWERFUL EXPLOSIVES, ETC. THE ABOVE ILLUSTRATION SHOWS A HAMMER OF FROZEN MERCURY

THE HORSELESS AGE.

AUTOMOBILES, MOTO-CARS AND OTHER AUTOMATIC VEHICLES.

The speed of an average railroad train made possible, with only good roads and clear right of way necessary. A vehicle that is destined to take the place, to a great extent, of horses, electric and cable cars, and cheapen as well as add comfort to conveyances.

THOUGH the manufacture and use of self-propelling vehicles are yet in their infancy, the industry is growing to such an enormous size that it is taking in half the carriage and wagon factories in this country. For many years attempts have been made to solve the problem of propelling wagons, carriages and other vehicles along the highways without the use of rails to run upon, and by some such motive power as steam, compressed air or electricity. Five years ago a few very expensive locomotive-like affairs had been turned out that operated with great fuss and feather, but were successful to the extent that large manufacturers employed skilled inventors to work out new ideas. Now we have the industry growing to great size, and such self-moving cars, wagons, trucks and carriages being used universally in the large cities, with the prospect of their invading the realm of the horse in the country before many years.

France at present leads in the use of these contrivances, and has a fashionable automobile club numbering 1,700. Recently an exposition was held in which 1,100 vehicles were shown, representing every sort and kind from a fashionable brougham to a milk-peddler's cart. The motive power in most of these machines is gasoline or naphtha, while those England has been putting out run mostly by steam. It has been left to America, as in most other things, to bring forth the perfect electric carriage. And this latter kind seems to give better satisfaction than any other, by reason of its safety, endurance and speed, extensive orders from Europe being proof of acceptance of the American models abroad.

To be worthy of consideration, the modern motor vehicle, no matter what its method of propulsion, should be odorless, almost noiseless, and free from jolting. Methods that are likely to result in explosions are being cast aside, and the weight of the motor, which is at present rather great, is being reduced as much as possible. Most of the carriages look odd to one seeing them for the first time, for, having no shafts or poles, they appear "bobbed" off in front. They are also rather too high for self-propelled vehicles, but soon they will have more graceful outlines and by having smaller wheels and less gearing the body of the vehicle will be nearer the ground. Of course, when a horse was attached to draw the wagon, it

was necessary that the wheels be high enough so that the rider could see over the horse's back. And when these new methods for travel were first attempted, the carriage as it had been was made use of without much change in appearance.

In America, altogether there are six motive powers employed: electricity, steam, gasoline, compressed air, carbonic-acid gas and alcohol. The first three have been applied with success; the others are in their infancy, while the new power generator, liquid air, is expected to bring forth great power ere long, in a compact and very light form. The

(Courtesy of Woods Motor Vehicle Co.)

AN ELECTRIC AUTOMOBILE ON ONE OF OUR CITY STREETS.

Electric Mobile

is the one in most common use in this country, and possibly has the combined qualities of being more rapid, cleaner and more nearly "fool-proof" than any other. The method employed for its con-

struction is similar to that used on any electrically-driven apparatus: namely, a strong motor attached to the wheels, and propelled by electricity from storage batteries carried on the vehicle. Such a motor is odorless, almost without vibration, and is practically noiseless. It can run with great speed and climb almost any hill road so long as it is smooth. Of course, it is very heavy, owing to the use of storage batteries, and it can run only a certain distance without being recharged with electricity. These batteries weigh from 500 to 1,500 pounds each, the vehicle weighing from 900 to 4,000 pounds. An ordinary lady's phaeton weighs about a ton, and carries a battery of 900 pounds. When the battery is empty it may be recharged again at electrical stations maintained for the purpose, after which the carriage is ready for its journey once more. The current not only operates the motor at the wheels, but also lights the lamps, rings the alarm gong, and, in cabs, actuates a push-button bell for communication between the passenger and driver.

Aside from the device for supplying power to the wheels, there are numerous others for guiding and controlling the machine when it is under way. Near the seat of the driver are a number of switches and levers, which to one just learning how they operate are rather bewildering. In fact, schools are maintained where persons are taught how to manage these roadsters. In France a special highway is prepared with dummy figures in the path where the beginner is learning, the object being to become so proficient that none will be knocked down by the carriage running away. The driver must keep his eyes wide open and both his feet and hands busy. With his left hand he grasps the power lever which controls the speed, while with the right he manages the steering lever. He has one heel all the time on an emergency switch that cuts off the current, and at the same time must ring a gong to warn people of the approach of his pneumatic-tired conveyance. With the other foot he manages a reversing-switch that will back the carriage, while with his toes he applies a quick brake. When he wishes to turn on the lights he presses a button under the seat. So it may be seen that he is rather busy, and can never go to sleep and let the old horse carry him home.

In all the large cities lines of these electric cabs are being established. Most of them run from twenty to thirty miles without new current. It is a simple matter to recharge

The Storage Batteries,

it being necessary only to put in a plug connecting it with the generator, somewhat after the fashion of a bicycle pump. This may be done at almost any electrical plant, and in some places, Belgium for instance, regular posting stations are being established, while coin-in-the-slot "pumps" will soon be arranged on the corners of city streets where a broken-down battery may be refilled.

The gasoline motors are in some ways inferior to those run by electricity; though all the long-distance races in Europe have been made in vehicles thus propelled This motor is lighter than the other kind and needs no recharging station, gasoline being procurable at any crossroads at a small price. On the other hand, these engines are not self-starting, a push on the piston rod being necessary, and then the carriage throbs under the motion of the machinery. The ins and outs of all the machinery must be thoroughly learned, and one really becomes an experienced engineer before he masters the art of guiding this sort of automobile. When one has learned, how

DIFFERENT STYLES OF AUTOMOBILES PASSING IN REVIEW. SHOWING THE DESIGNS BUILT BY THE WOODS MOTOR VEHICLE CO., CHICAGO.

ever, he is master of the situation, for he may travel up to fifty miles an hour on smooth roads, and through mud and other difficulties at less speed, with the aid only of a can of gasoline

The process of

Power Generation by Gasoline

is very simple It is known that this liquid mixed with certain quantities of air and confined will, when ignited, explode with violence. A cylinder is devised which admits this combination at one end, the gas is exploded at the proper time and drives out the piston rod, which in turn causes the fly-wheel to revolve, drawing the piston back to its old place once more, after which the operation is repeated. Most of these engines operate under four cycles or impulses. During the first the vapor is drawn into the cylinder during the second it is compressed by the return piston; during the third it is exploded, and in the fourth the products of the explosion are driven out, and the cylinder is ready for the new charge. In most engines the explosion is caused by an electric spark, there being no fire on the vehicle Owing to the heat generated by the explosions going on all the time, the machinery must be kept cool by being cased in water jackets In

some cases the spark is done away with by having the compression of the gasoline so great that it explodes of its own heat. Different devices are made for mixing the proper quantities of gasoline and air, and many improvements are going on in general to do away with odors, vibrations and the like.

The cost of owning and operating automobiles for a period of several years is really considerably less than that of horses and carriage, and especially is this true of the gasoline kind. Many of the gasoline vehicles will run 100 miles on a half-dollar's worth of liquid.

Steam engines have been used to some extent for both trucks and pleasure vehicles with success. For the latter, however, they are not as yet in the stage where they are desirable, there being a great deal of complicated machinery to run which requires a regularly licensed engineer; and then there is generally a puffing sound and escaping steam at the exhaust pipe. However, for traction engines, trucks, fire-engines and omnibuses, they have proved eminently successful, because of the ease with which fuel and water may be had. As yet,

Compressed Air

is rather cumbersome to handle. One truck has been constructed which has a set of cylinders operated by this method somewhat after the style of steam. The compressed air is held in huge steel storage bottles or tubes, which are carried under the wagon. Difficulty has been had from the freezing of the valves when the air is turned on and escapes rapidly. This is because of the great reduction of the temperature about the pipes when the air expands and sucks up latent heat. To avoid this a system of hot-water pipes heated by a gasoline flame is arranged, that keeps the valves from cooling too much. Because of the great weight of these trucks they are as yet not much used. However, improvements are being made daily. One inventor has arranged a small gasoline engine that generates electricity in the front of a truck and stores it in batteries at the back. From these storage batteries the current is drawn which runs an electrical motor This truck weighs, however, over 9,000 pounds, and when loaded about 25,000 pounds, making it a serious question for good pavements.

The Uses

to which automobiles are being put are numerous and varied. All sorts of pleasure vehicles are already in use, together with cab and omnibus lines in competition with street-car lines. A railway hand-car has recently been put in use, of the gasoline velocipede type, capable of carrying three persons at the rate of thirty-two miles an hour. The Parisian fire department uses an electric automobile the battery of which is only one-fifth the weight of the whole apparatus including the crew. It is capable of traveling four or five hours at the rate of twelve miles an hour. In other fire departments many of the light buggies of the chiefs and marshals are driven by electricity, and run from forty to fifty miles per day. The post offices of several of the larger cities are now using autowagons for delivering and picking up mail, while nearly all the great department stores use electric wagons exclusively in their delivery business. The War Department at Washington has recently taken official cognizance of the automobile by ordering several wagons for the Signal Corps, and soon it is expected ambulance and ammunition wagons will be ordered of the same kind.

It may readily be imagined what will be

the outcome of these marvelous strides in perfecting self-propelling vehicles. It means better pavements and roads all over the country, and in the city before long the noises from the harsh rumbling of wheels and the crash of the horses' hoofs will be replaced by the rapid swish of the pneumatic tires.

Already capital to the amount of $400,000,000 has been invested in the manufacture of these vehicles in New York, Chicago, Boston and Philadelphia. Laws have become necessary for their regulation. In France they must be licensed, and the driver must have a certificate of proficiency. Speed must not exceed 18½ miles an hour in open country, or 12½ miles in passing houses, while in narrow thoroughfares it must be reduced to walking pace. All sorts of names are being proposed for this style of vehicle, from "horseless wagon" to "self-propeller" and "autocar." It seems, however, that the French "automobile" has come to stay

(Courtesy of the Woods Motor Vehicle Co.)

A TRIP INTO THE COUNTRY IN AN AUTOMOBILE OF THE ENGLISH TRAP DESIGN.

MARVELS OF THE RAILWAY.

GREAT WEBS OF STEEL BRIDGING VAST CONTINENTS,

Giving the North the fruits of the tropics fresh from the trees and vines, the South the grains and other products of the colder climes. Uniting the East and West by shortening the time, making travel a luxury and lessening expense.

DOWN to 1850 progress in railway building was very slow, but shortly after came a great "boom" in stocks, and the years succeeding 1865 were noted for their vast strides in railway improvements and construction. Seventy years ago there were not twenty-five miles of rail in the whole country; to-day the total mileage of the United States is nearly 200,000. This is about half the number of miles in the whole world.

In 1850 nearly all the roads were confined to the North Atlantic States, but in the next decade a number of lines were pushed west to the Mississippi, and shortly after came the first great transcontinental system to the Pacific. The railroads built in the west were necessarily forerunners of civilization, and where the engine had to go under armed guard to keep off the attacks of the Indians, it was not to be expected that construction would be other than cheap. Towns did not have to be consulted as to rights-of-way, for towns followed rather than preceded the railroad. As years went on, however, this cheap method of building was thrown out for new and modern improvements, and to-day every-

(Courtesy of C., B. & Q. Ry.)

MODERN A LA CARTE DINING CAR.

where old wooden culverts are being replaced by steel bridges, secure rock ballast is taking the place of the bedding that was formerly so easily washed out, and heavy and continuous steel rails now form even and smooth tracks, instead of the old warped iron affairs. Curves have been straightened, steep and dangerous grades have been abandoned for cuts and tunnels, and instead of the murderous grade-crossings we are now being supplied with elevated systems and block signals. All this takes enormous wealth, but the roads are constantly increasing in that direction. It is true that many improvements are yet to be expected, even with our "lightning flyers," ere travel will become perfect, but these improvements will be along the lines of the already existing roads, rather than along new lines yet to be laid out.

If construction in the number of miles laid out has been great, even greater has been the development in the

Luxury and Ease of Traveling.

Some forty years ago the continuous steel rail had not been invented, and the link-connected cars clattered along over the disjointed rails with a rattle and bang that was nerve destroying. The only conveniences then provided for, even on the "through trains" across the country, were a few telegraph blanks, a separate smoking apartment, and, in some cases, a buffet from which were served food and drink of poor quality and enormous price. The night train was a thing unheard of and the Pullman sleeper had not yet made its appearance. To-day one journeying from coast to coast need hardly give a thought as to his comforts after he has boarded the modern cross-country "flyer." Trains are now really almost smooth-running, and are equipped with every device for comfort that man can imagine. Drawing-room, observation, dining, and sleeping cars arranged with an eye to artistic effect as well as to luxurious comfort, are ever being improved upon by the companies, while electric and gas lights, vestibules between cars to keep out noise and dust, barber shops, buffet smoking cars, card rooms, and libraries and music rooms, with waiters and porters at every turn, are daily adding to the ease of travel, as well as to the pocketbooks of the railway magnates.

(By Courtesy of the "Burlington Route.")

A GENTLEMEN'S CLUB ON WHEELS.

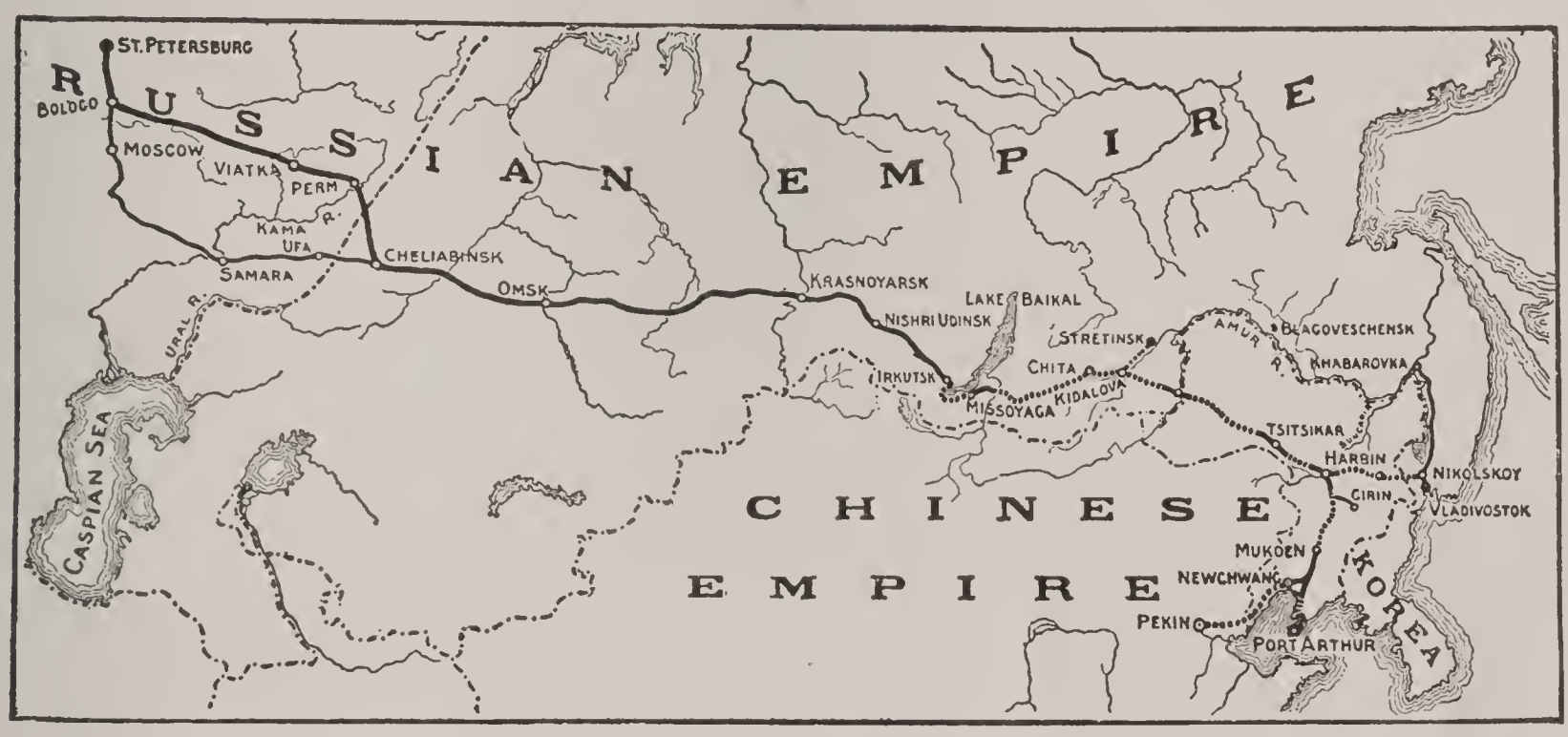
Interior view of a modern buffet and smoking car.

New Construction.

To think, then, that all these devices will soon be applied to trains of cars running regularly across every continent on the globe is to wonder what will be the limit of man's power. To-day there are in course of construction two marvelous lines: one, the Trans-Siberian route, being laid by the Russian government from St. Petersburg, Russia, to Port Arthur, China, thus taking in all the resources of unknown Siberia and China; running along the gulf coast to Guatemala, then along the border and down through the South American states to the Pacific coast, thus making a thread line from North to South America.

Trans-Siberian and Chinese Eastern Railways.

Had Russia imagined in 1867 that she could ever have accomplished such a work of engineering skill as that of the construction of the Trans-Siberian and the Chinese Eastern Railways, she never



A MAP OF THE TRANS-SIBERIAN AND CHINESE EASTERN RAILWAY,

Showing the entire route from Port Arthur to St. Petersburg. The dotted line marks the course where work is not yet completed.

the other, the "Cape to Cairo" route, as yet only partly built and partly on paper, but a marvel in imagination, extending from the Cape of Good Hope, at the most southern extremity of Africa, up through unknown savage lands to its northern terminal at the old capital of the Pharaohs, Cairo, Egypt. Besides these two great undertakings, there is one of similar nature being promoted by American capital that is to be called the Intercontinental Railway, or the Pan-American Road. At the expense of $25,000,000 it is to connect this country with the South American states, starting from Matamoras, on the Rio Grande border, would have sold to the United States for the paltry sum of of $7,000,000 the great territory of Alaska. Instead she would have been our neighbor, with a seaport at Fort Wrangell, almost at our doors on Puget Sound, and England, with ever-watchful eyes, would turn from Russia at the gate of Herat to Russia within a day's march of Vancouver. But the first work of building this great thread across a continent full of superstitious semi-savages was not commenced till May 30, 1891, when the present Emperor, then Czarovitch, on his way around the world, visited Vladivostok and drove the first spike. It was then thought that the

Trans-Siberian could not be completed till 1905 or 1907. That was before the Chino-Japanese War, and a route had already been mapped out along the southern border of Siberia to Vladivostok, a port on the Pacific just north of Korea that is ice-bound all winter. This port was practically the only outlet for Russia on the Pacific, and accordingly great outlay was made for piers, ice-breakers, etc. But after Russia's aid to the Chinese in the war with Japan, China felt very grateful, and as a mark of esteem gave her benefactor great privileges in Manchuria, among which were the rights to build the Chinese Eastern Railway and to lease Port Arthur as its eastern terminus. This port is open the year round, so Russia at once gave up her other surveys along the Amur River, and instead began to throw out a line of roads to the southeast through the most fertile part of China, to end at Port Arthur, and with branches to Pekin and Vladivostok.

The Trans-Siberian Road

itself is practically complete, and after an expenditure of $150,000,000 has a through line from Irkutsk, on Lake Baikal, extending 4,000 miles to St. Petersburg. Across the lake to Missoyaga trains are being carried on great steel barges or ferryboats. Beyond this point the road runs in more or less complete state in an easterly direction to Stretinsk, and from the port at Vladivostok directly northward to Khabarovka. The country lying between this latter point and Stretinsk was to have been covered by a line that would have directly connected St. Petersburg with Vladivostok. But with the donation from China, as said before, this line was abandoned, and now the eastern terminus of the Trans-Siberian route is at Stretinsk, while a little to the south and west of this point, at Kidalova, the main Russian line is tapped by the Chinese Eastern Railway. The work across Siberia was full of difficulties, much of the land never having been traversed by white men before. Convict labor has been used to a great extent, thereby cutting down expense. Expense has not been spared in the least, however, to give good construction, and above all else is considered safety Bridges that are marvels in civil engineering span numerous rivers between Stretinsk and St. Petersburg, twenty millions having been expended in this line alone. The largest and most costly of these is the great iron and stone affair that spans a distance of 3,150 feet over the Yenisei at Krasnoyarsk. It stands on five colossal circular stone piers, with matching stone abutments, and is thrown over the river in five spans. The cost was $2,300,000; the work was designed by Knorre, once a German, but now a naturalized Russian. Another great bridge, costing $2,000,000, extends over the Obi River at Kolivan. During the winter, when the rivers are deeply frozen, such parts of the road as yet have no bridges are strung temporarily across on the thick ice, and later are replaced by steel culverts.

The work of most interest at present, however, is that upon the

Chinese Eastern Railway.

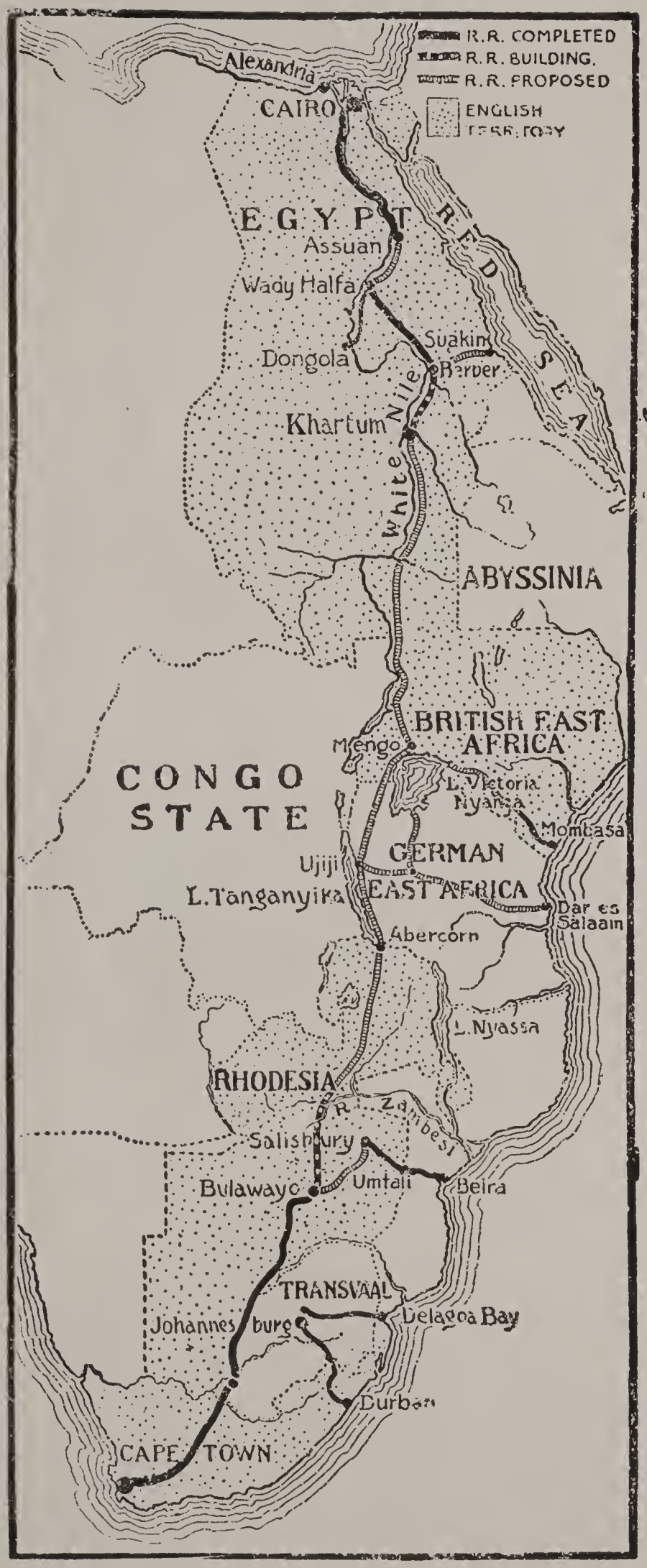
which, though in direct conjunction with the Trans-Siberian road, is yet kept entirely separate in its finances and outward dealings with the public. In 1896 Russia contracted with China to build a road through Manchuria, guaranteeing that the president should be a Chinaman, and that at the end of eighty years the entire ownership of the road was to pass to China upon payment. The route was at once mapped out, and for rapidity of construction this line holds the record. The work

is being done by both Siberian convicts and Chinese coolies, while almost every tool and modern means of equipment is of American manufacture. The guards along the route are mainly Cossacks, and they dress half in Chinese and half in Russian costume. The flag of the company is likewise half of one country and half of the other. Of course, the enterprise is wholly Russian; and the result of this enterprise is startling. Cities have grown up all along the country that was formerly wilderness. To think of the wonderful civilizing effect of this railway is startling. The road covers like a hand 400,000 square miles of rich Chinese territory. The main line extends southwest from Kidalova to Vladivostok, while about midway it is tapped by a directly southern branch at a new town called Habin. From this point it runs to Port Arthur and to Pekin.

A CONVICT CAMP ON THE TRANS-SIBERIAN RAILWAY.

A Cossack guard is about to conduct a body of convict laborers to their daily task. This class of labor was largely used in the construction of the Trans-Siberian Railway.

Work on the new route is continued throughout the winter, aided by the use of American tools and supplies. European methods are in the main crude along engineering lines, and American enterprise supplies this work with nearly everything from steel for bridges to pick-axes and cross-ties. Rock drills caused a great deal of trouble, however, among the native Chinese and also to some extent among the convicts. It was impossible for these ignorant people to understand the workings of such an engine without visible motive power, and they at once came to the conclusion that the work was done by the white man's "slave devil." The result was that 10,000 workmen struck, and it was only with the greatest difficulty that they were induced to return to work. Eventually they became amused at the workings of the machines, though they still think them controlled by evil spirits. What has already been accomplished by the construction of such a great railway may be shown by noting that Habin, the junction of the two great railways, as well as headquarters of their officers, was not on the map at the close of 1899, and yet it is destined to be the Chicago of northern Asia. Already in this city are magnificent office buildings and dwellings, and broad and electrically lighted streets are to-day being paved in the most improved methods. Palatial



LATEST MAP OF THE ROUTE OF THE "CAPE TO CAIRO" RAILWAY,

Showing also southern countries now involved in war with Great Britain.

steamships arrive and depart daily, and machine shops, banks, ice-factories and other enterprises are numerous. To sum up the gigantic effort, a trip of 10,000 miles, or nearly half-way round the world, can soon be made without changing cars!

The Cape to Cairo Railway.

Were English capital being invested for the building of the Trans-Siberian and Chinese Eastern railways, we might see the value of the speculation, for it is only that nation that has colonies scattered all over the globe that will greatly benefit by easy means of communication between them. Russia, however, is not building these great distance-bridging webs of steel for the money there is in it; rather for the purpose of bringing her great domains together. But if Russia is outlaying millions of capital in a costly venture, England is risking still more in the scheme to build a railway throughout the length of Africa from the Cape of Good Hope to Cairo. Cecil Rhodes, the genius of South Africa, promulgated the idea, and though capital has been scarce for the purpose, yet the time is not more than ten years off when the most gigantic of all daring feats will have been completed. From point to point the distance to be covered is about 6,600 miles. Of this over 3,000 miles is already constructed, but the remaining portion, 3,200 miles, is yet to be strung across the most difficult stretches of land in all Africa. The total cost of the whole enterprise is estimated at $125,000,000, but as the northern and southern extremities are already laid, it will need only about $75,000,000 more.

And there really seems no reason for building this middle section now either. In the south from Cape Town to Bulawayo, and on the southeastern coast from Durban, Delagoa Bay, and Beira into the

interior where the lines have already been built, there was some reason for an outlay of capital, because of the great resources of the country, especially the gold and diamond fields. Likewise on the north it has been necessary to run lines to the south because of their value for the military in subduing the Mahdi. But from Khartum or Berber south along the White Nile and through the malarious lake regions, where the underbrush has yet no trail of the white man, it seems folly thus to put up a road over which there is no likelihood of traffic. At the best, the time of travel from Cape Town to Cairo and then by water to London, will take fourteen or fifteen days, at a heavy expense and with discomfort across the deserts, while the whole trip can now be made cheaply by steamer around the west coast of Africa in but two days more. However, the road is being built, and as such merits admiration.

The English government is not the pusher in this enterprise; whatever matures of the marvelous scheme will be due to the domineering pluck of

Cecil Rhodes.

When he first conceived the idea he figured on making a forerunner of a telegraph line. This had money in it, and though set upon by great obstacles, Rhodes has the line well under way and is endangering the revenues of the submarine cable lines to the Cape. The only place that he had great difficulty in securing right of way for the telegraph was through German East Africa. Here, for the privilege of running his own wires, he must also at his own expense run other wires for the German government, which they will keep up at his expense for forty years, and then they go to Germany without compensation.

From a point on the Zambesi River in Rhodesia it is planned to run the railroad north to Abercorn, then along Lake Tanganyika to Ujiji. From this point it will cross to Mengo in British East Africa, and then probably skirt the western edge of Abyssinia, avoiding as much as possible the malarious districts. Completed roads to Assuan in Egypt existed before the recent trouble with the Mahdi, and when General, now Lord, Kitchener, Sirdar of the Egyptian army, started from Wady Halfa towards Khartum, other lines were thrown out to transport the army and its supplies. As it is, completed lines now practically cover the district to Berber, and a road is being run to Khartum.

January 20, 1909, is set as the day for the laying of the last rail in this great stretch of track. This gigantic enterprise is likely to add greatly to the domain of Great Britain in that part of the world.

Ninety Miles an Hour

Speed on railway trains has been developed to at least ninety miles an hour between stops on level road. This has been done in actual work of carrying mails, and was the outcome of a race against time that took place January 1, 1899, on both the C., B. & Q. and the Northwestern railways on their respective lines running from Chicago to Omaha. With our new possessions in the Pacific Ocean any time saved on the way to the coast is of importance, and it was to secure mail contracts to these points that such speed was shown. It is no uncommon event to-day to travel at the rate of over fifty miles an hour, including stops, but extremely high rates of speed are not usually developed on passenger trains. When ninety miles are whizzing past in sixty minutes it taxes to the utmost the nerves of the engineer. All sorts of sights and noises are magnified in the night, and even if engines are improved

to fly at the rate of 150 miles an hour,—which it is said will before long be possible,—the driver of the engine would be able to run his train only a few years before he would be a physical wreck. With the improved headlights shadows are increased, and though the long stream of light aids in detecting breaks on the track at night, such a thing as a small fly traveling over the face of the lamp is enlarged to great size in a shadow on the track. The wind whizzes by, and when another train at an equal speed of ninety miles an hour from an opposite direction passes by, the two are coming together at the rate of 180 miles an hour. With all these strains, the engineer wishes to reduce rather than to increase the speed.

(Courtesy of C., B. & Q. Ry.)

NINETY MILES AN HOUR.

"Burlington Route," Denver Limited Express Train.

Wireless Telegraphy.

MESSAGES SENT ACROSS SPACE, OVER WATER AND THROUGH MOUNTAINS WITHOUT THE AID OF WIRES.

Bridling one of the most delicate forces of nature, and making it do marvels in the service of man.

SINCE the perfection of the telegraph and telephone for commercial purposes, and the laying of cables across the ocean for the transmission of messages, electrical experts have been studying the problem of transmission of electrical energy for messages without wires. Gray devised a method of sending signals along light waves, and others tried transmitting telegrams to moving trains by means of the rails. These methods, however, were not successful in the main, and it was left for

M. Guiglielmo Marconi,

a Florentine yet in his twenties, to discover that Hertzian waves could be generated from electricity and sent across space without the means of intervening wires.

In 1895, while yet quite young, Marconi made experiments across his father's fields in Bologna, Italy, and by the use of tin boxes, called "capacities," set upon poles of varying height, and connected to separate instruments by insulated wires, he sent and received by a crude transmitter and receiver electrical signals without the aid of intervening wires. He soon learned that certain distances could be covered only by having the poles for his boxes of certain height, and the height of the poles had to be increased with the distance. He experimented with the aid of several other scientists for some time, and then the world was startled early in 1899 by the news that messages had been sent by this wireless method across the English Channel from Dover to Boulogne. Little had been known up to that time of the process, but enthusiasm was now expressed everywhere, and when, in October of the same year, the young wizard came across to America to report the great international yacht races between the Columbia and the Shamrock, for the New York papers, and succeeded so admirably that messages were flashed across space when both yachts and sending ship were enveloped by fogs and out of sight of land, it was manifest that another epoch-making discovery had been made.

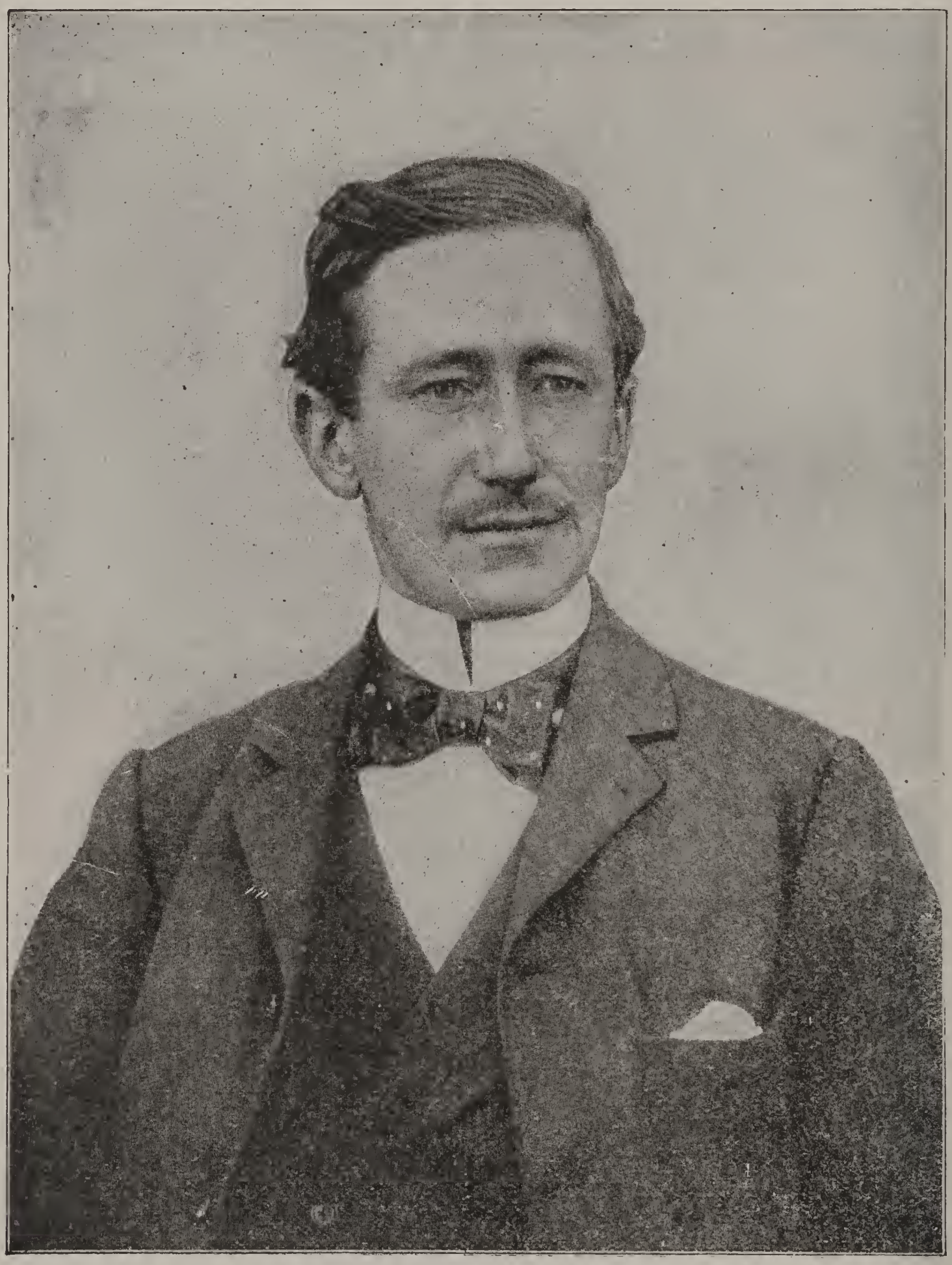
The method employed by Marconi seems quite simple when it is known.

Hertzian Waves

are strange undulations generated by electric impulse that travel through the atmosphere and have the peculiar property of jumping from the Marconi transmitter and fleeing through space at the speed of light, or seven times around the

earth in a second. When Marconi understood that these beams could be sent and received by his first crude method, he at

sending and one at the receiving station. From these poles are supported sprits, along each of which runs an ordinary



M. GUIGLIELMO MARCONI,

Discoverer and inventor of the Wireless Telegraph.

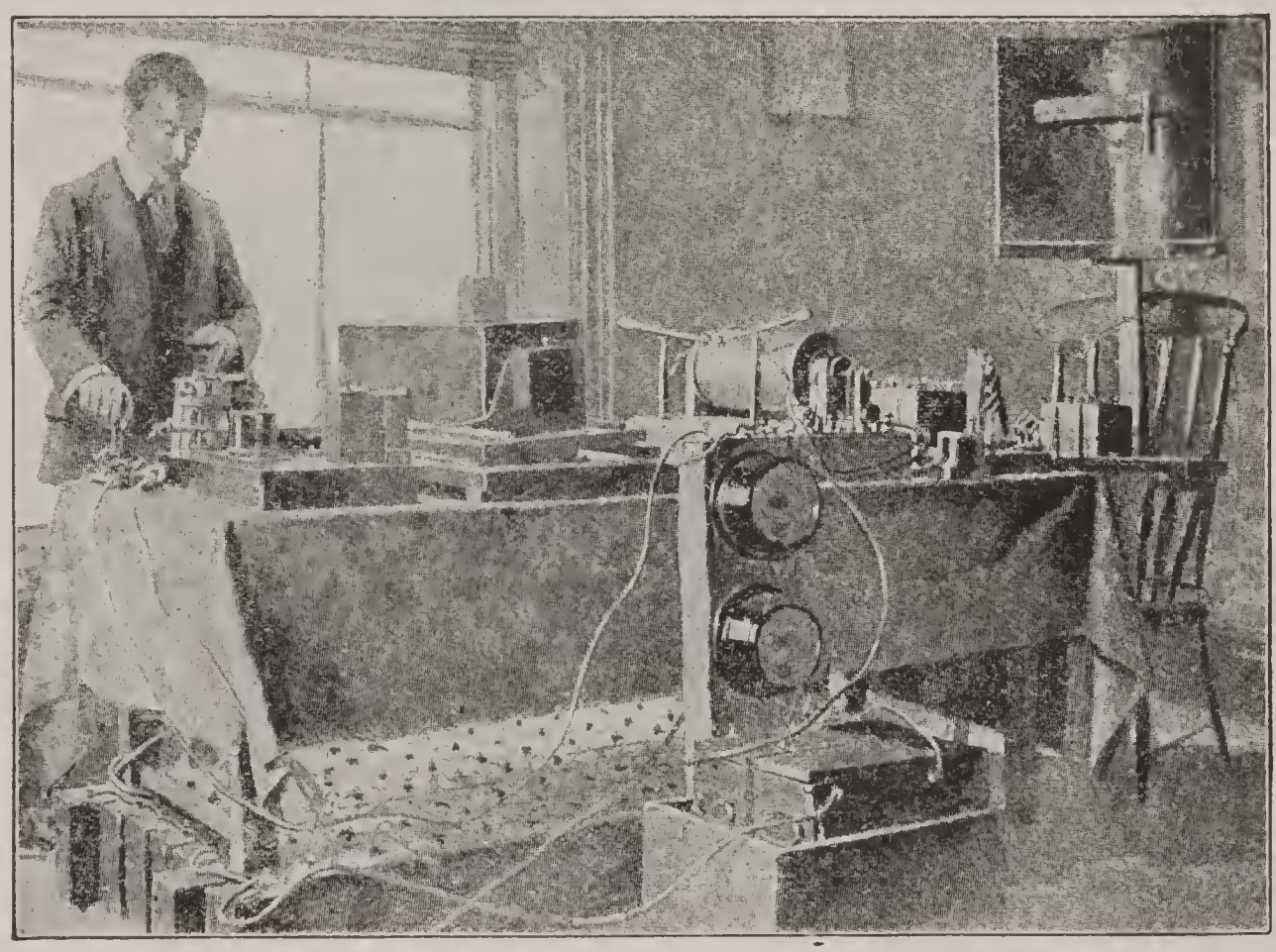
once set to work on improvements, and the following system has been the result:

Two tall poles are erected, one at the

copper wire extending vertically from the telegraph instruments into the air. The upper portion of the wire is bare, so that

the waves of energy may leap off into space as they are sent up the wire by the operation of the instrument below. This instrument is simply a large induction coil connected with a strong battery. To the coil are also attached two brass knobs (some distance apart), from the space between which, when the current is on, leaps a stream of sparks, the same as those produced in experiments with the X-ray. Now, when a message is being sent, the transmitting wire is charged with a current of electricity at high tension, which naturally rushes toward the earth. This discharge causes a rapid oscillation in the wire as long as the current continues. This oscillation must have an outlet, and, accordingly, leaves the wire for its journey across space. This agitation, when it reaches the receiving instrument, produces an opening and closing of the circuit accordingly as the waves are continuous or cut short. To use a simple example, let us suppose we have a string hanging loose from the ceiling. Now take a fan and wave the air. The result is the string is blown back. Make several motions with the fan at short intervals, and the string will respond to the air waves. This is similar to what occurs in Marconi's telegraphing process. He has a switch connected with the sending instrument, and as he opens or closes this a stream of electrical sparks follows. It may readily be seen, then, that as these sparks impart the waves to the transmitting wire, a short one would send a short wave across to the receiver, and a long stream would produce a long set of waves. That is just what happens.

When this much of the system was perfected, it was necessary to arrange some device whereby the gentle oscillations might be received and interpreted into messages. Here was a hard task, but it was successfully wrought out. In a metal box, that keeps out to a great extent the Hertzian waves, is a relay instrument, two devices called a "coherer" and a "tapper," and a Morse instrument for printing dots and dashes connected to a home battery. The



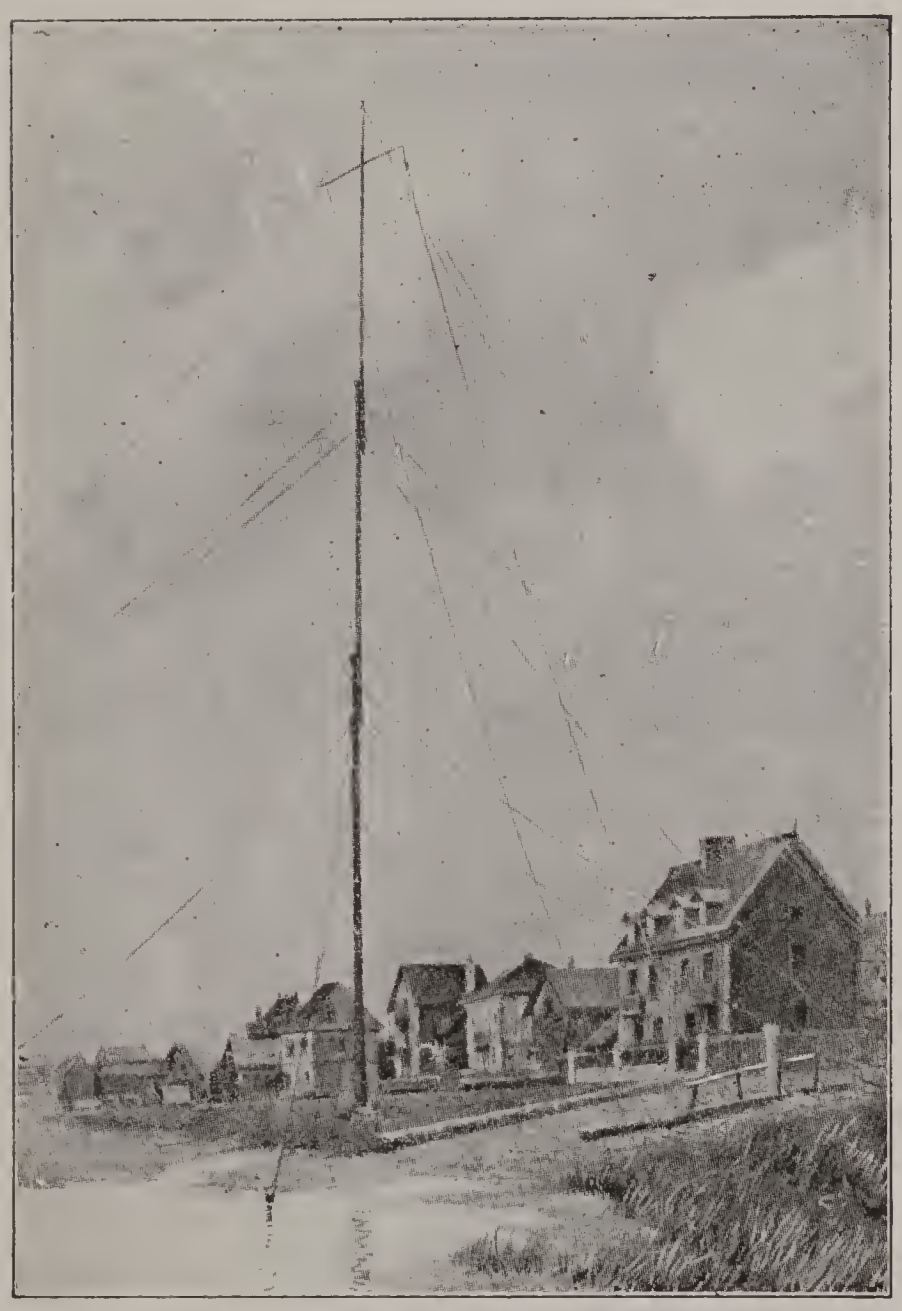
A WIRELESS TELEGRAPH STATION.

Showing operator in the act of sending a message. The large box on the table near the operator contains receiving instrument; the adjoining cylinder with the two rods ending in knobs is the sender; while in upper right-hand corner is the copper reflector used for directing the waves.

'Coherer"

is the principal and most delicate of all these instruments, and upon its actions depends the success of the sending opera-

tion. It consists of a tiny glass tube about as thick as that of a thermometer and two inches long. In either end is a small plug of silver, attached to the aërial wire on the pole outside and to a wire connected with the relay instrument. It must be understood that a wave so delicate in its impulse would not be able to operate a machine of itself; it is only strong enough to give the impulse that will complete the circuit of the home battery, and the latter then works the writing machine.



EXTERIOR VIEW OF A WIRELESS TELEGRAPH STATION.

From the sprit at the top of the mast is suspended the copper reflector which sends the Hertzian waves shooting across space. The wires attached to the mast are only for support in heavy winds.

But how can this impulse be given in dots and dashes of the Morse telegraph code? Simply enough, when one knows how; and here came in Marconi's greatest discovery. He learned that nickel and silver were alternately good and bad conductors of the Hertzian waves: good when welded together by a continuous current, but bad when severed into particles by a blow from his little "tapper." Hence, he contrived an arrangement of very tiny particles of nickel and silver dust,—siftings through silk,—and placed them between the silver plugs of his "coherer." Now, when a wave impelled by a single spark from the transmitter is received by the vertical wire hanging in space from the pole of the receiving station, it comes down through the "coherer," and the tiny particles of nickel and silver cohere (hence the name), the current is imparted to the battery that sets the Morse instrument to printing a dot.

To explain more clearly just the uses of the "coherer" and the "tapper," we must remember that the power of the Hertzian wave is very slight; in fact, it could create no electrical disturbance were it not for its property of welding together the nickel and silver filings in the "coherer." What it can do, however, is to complete the circuit that will operate the relay instrument. Let us imagine the circuit of the relay is like an electric door-bell. Well, the coherer is in the place of the push button. As long as the filings are separate there is no sound, for the circuit is not complete. But let a Hertzian wave strike the coherer and the filings are welded together, the circuit is completed and the relay instrument gives the sufficient electrical energy to operate the writing machine or ticker. But so long as the filings in the coherer are in cohesion the instrument will keep up one continuous buzz; hence no intelligible signals could be sent. Here is where Marconi made use of his.

Decoherer or "Tapper."

It is no more than a little hammer attached to an electro-magnet, which, when operated by electricity, will tap against the coherer the same as the tapper of an electric bell; and this blow decoheres the filings. Now, when the Hertzian wave reaches the receiving station it rushes down to the coherer, the filings are welded together, the circuit is completed, and the instrument ticks off its dot. At this instant the relay instrument has also sent a current to the electro-magnet of the tapper. The magnet draws back the little hammer and lets it strike the coherer, the filings are separated, and the station is ready to receive the next flash.

Each succession of waves produces the same effect, and the operation is repeated, the result being an intelligible series of dots and dashes which are readily translated into their proper meaning.

Messages by wireless telegraphy have already been sent with accuracy up to 110 miles, of which sixty were over water and the rest over land. Messages are not lost by the curvature of the earth, which is about 1,000 feet in eighty miles, and they work all right from a wire 130 feet high. Weather conditions cannot interfere, nor can the messages be stolen, for the reason that the transmitters and receivers must be in "tune,"—that is, they must work in harmony. This makes it almost impossible for the receiver to take a message not intended for him. The electric waves do not seem to be impeded by buildings or hills in the intervening space, for experiments have shown that messages sent to given destinations, between which and the sender were high hills, buildings, etc., have been accurately received. Whether the Hertzian waves go through or around the intercepting object has not yet been ascertained.

The Principal Cost

of installing a wireless telegraph plant is that of the poles, the receivers costing only about $60. The expense of maintaining the electrical current is nominal. Each station has both a sending and a receiving instrument, one being turned off when the other is in operation. Messages can now be sent at the rate of twenty-five words a minute, so it may readily be seen that when the system is still more perfect, it may threaten the established telegraph lines. Imagine another Eiffel tower on this side of the Atlantic, with sending and receiving stations here and at Paris. The expense of laying and operating the great submarine cables would be entirely done away with.

Already the system is in use on lightships, connecting them with the life-saving stations on shore, and many lives and much property have been saved by its use. What, then, if every ship or train had these instruments? Accidents might be avoided, news imparted without stopping, directions given for war vessels' manœuvres, and countless other similar uses. Marconi thinks some of the greatest improvements in this line are yet to come. He has already devised a sort of reflector that concentrates the waves and shoots them in one direction, like a search-light, so that they may be directed at will, and only to certain spots. He is also working upon an arrangement that will tell from what direction a message comes. He speaks of possibly arranging a set of senders and receivers and so manipulating them for subscribers that

The News of the Day

can be telegraphed all over the country, thus doing away with newspapers

Modern Wonders of the Electrical World.

RAPID TELEGRAPHY, PICTURES BY WIRE, STIMULATING THE GROWTH OF PLANTS BY ELECTRICITY, ETC.

The marvelous strides taken by American genius in the perfection of new devices and inventions which harness this weird fluid of the air and make it do service in the aid of man.

ASIDE from such marvelous discoveries as the wireless telegraph, the X-rays and the uses to which electricity has been put as a motive power, there are many minor experiments that are daily being made which are rapidly bringing this weird fluid nearer and nearer to our daily life, both for comfort and for money-making. A directory recently published gives the names of 25,464 firms carrying on electrical business throughout the world. The United States, as in most other things, is taking the lead in this important work. Daily we are shipping to Europe and the Orient motors and electrical storage outfits in great numbers.

While in many instances the American trolley system for street cars has proved dangerous, it is, nevertheless, being rapidly taken up in Europe. Electrical plows are being installed on the larger farms, and lighting by electricity is now almost universal. The success of using water power at Niagara and elsewhere for generating this force is remarkable, and the use of the tides about Manhattan Island, upon which New York City is situated, for this purpose has been advanced as tenable.

Telegraphing 100,000 Words an Hour.

In telegraphing many improvements have been made, among others being one system whereby the wires are attached to a sort of electrical typewriter, which, upon being operated, sets in motion a similar machine at the other end. The benefit of this system is that the operator does not need to be acquainted with any particular method, any one who is able to spell being competent to work the machine. Another recent invention in this line is a method of perforating strips of paper with a machine similar to a typewriter, and then placing these strips into the sending device, which transmits the messages at the rate of 100,000 words an hour. This is a marvelous speed, and where the time is saved is that a number of men can be set to work at one time perforating the strips before using the wire for sending. The benefit to be derived from such a system is that there would be a great saving in laying additional lines, for once the strips are prepared the sending occupies the line but a few moments.

Picture Telegraphy.

Sending pictures by wire has at last come so near to perfection that it is being used to some extent in detective work. The method used is called telepantography. By it an engraving or artist's sketch may be sent over almost any distance by common telegraph communication. If a picture is to be transmitted it must first be treated to a process similar to that for a half-tone engraving. A

metal plate is made, very thin so that it may be bent round like the cylinder of a phonograph. The plate is slipped on the transmitting machine, and a tiny needle on this device traces over all the lines in the metal plate, in this way sending impressions to a cylinder at the other end of the line, about which is wrapped a coil of paper. An inked needle at the receiving end traces the lines as they are telegraphed, and a complete reproduction of the original picture is the result. The device is yet rather crude, but practical results have been obtained.

Electrical Plant Growth.

The qualities of electricity, though when in the form of lightning and strong direct currents readily take life, are such that in other forms as readily give life. Recently experiments have been made on seeds, and in one-half the time it takes Nature to turn out her work by ordinary processes, the application of electricity has brought out mature plants.

The first experiment was made on an egg that was being hatched. An electric current strong enough to kill a fowl did not destroy the germ of vitality, but the chicken when hatched was of most abnormal size and monstrous in shape. This proved, however, what might be done with this marvelous agent.

In plant stimulation the apparatus consists of two glass cylinders, a larger one about two inches in diameter for the larger seeds, and one about three-fourths of an inch for those of less size. Within these receptacles the seeds are placed, thoroughly moistened, and the openings closed with copper disks having wires attached. By these wires the disks are connected with the poles of an induction coil, and then the current is passed through the moist seeds, which are good conductors. After this treatment the seeds are placed in germinating pans. These consist of two plates one within the other, the inner being of porous clay. The seeds are sown between two sheets of filter paper, and water passing through the porous plate is absorbed by the paper, thus keeping the seeds moist at all times. The temperature is kept at about 48 degrees all the time by aid of electrical devices, and the growth of the plants is 30 per cent quicker by this method than otherwise, while, at the same time, many seeds not perfect enough to grow under ordinary climatic conditions are saved by this electrical treatment.

Wireless Light.

Nikola Tesla, one of the greatest of electrical wizards, has been at work some time perfecting several devices by means of which he can send wave impulses at great distances through the ether, but in different manner from the Marconi system. He has made the assertion that if Mars is inhabited he can create a great enough current to be felt there. He is also at work on wireless light. But both these inventions are as yet void of commercial value. Some time ago, at an exhibition in Chicago, he conducted a series of experiments in throwing his waves across space and directing miniature war vessels in a tank of water without the aid of connecting wires. Waves were sent across to a receiver, which opened currents that turned switches and set in motion the machinery. It is claimed for these inventions that, when perfected, torpedo boats can be more effectually directed toward the enemy's vessels.

New Studies of the Starry Skies.

ASTRONOMICAL PROBLEMS AND RECENT DISCOVERIES.

THE WORLD'S GREATEST TELESCOPE.

Achievements of the world's greatest star-gazers, and the latest and most delicate devices used by them, giving to the student new facts concerning orbits, seasons, atmospheres, and climatic and general conditions existing on the planets, moons and suns.

PROF. SIMON NEWCOMB, the well-known astronomer, uses a very startling method of comparing the size of the universe, so that we may judge its size by things earthy. Imagine the United States as the extent of the whole known creation, and compare to it a lady's finger-ring as the earth's orbit around the sun. The nearest fixed star would then be about a mile and a half away from the ring, and all the space from the Atlantic to the Mississippi would be studded with other stars, planets and constellations. It has recently been learned that the whole solar system, with the sun, earth and all the other planets, is traveling toward the constellation Lyra at the rate of three hundred millions of miles a year. When we think of this constellation as being about ten miles away from the finger-ring spoken of, we can readily see what enormous distances we are traveling, and little wonder is it that great minds are trying to solve the problem of where and when this vast and furious race began, and where it will end. An astronomer who might watch the heavens for ten thousand years might gain some faint suggestion of the answer to the riddle. But our sun and its system are not the only moving bodies in the universe.

Thousands Upon Millions

of other stars like our sun are traveling in some direction, and with greater or less force. A greater question, then, is what means the motion of all these other bodies, and where will they end? Some astronomers suggest that each system is shooting off on a curve that thousands of centuries will complete into orbits. Others say that if the laws of motion be true for all space and all time, it may be that each moving star will go on in an unbending career forever, unless attracted aside by others. In that case, after absorbing many smaller stars, a few of the larger bodies would gradually drift apart and the inhabitants of each would then behold only black and starless skies. All this is amazing in its proportions and grandeur, but as yet theories only exist, for with millions of bodies flying in different directions and at such frightful speed as 200 miles a second, calculations are at best but weak.

Another problem that presents itself to star-gazers is that of the

Size of the Whole Universe.

With the latest improved telescopes we are able to see only what is considered a very small portion of the vast extent of star-filled space. We are able at present to count, by means of photographic telescopes, some hundred millions of these bodies, but it is not supposed that we have reached anywhere near the edge of the limits of their confines. In fact, astronomers hardly think they will be able ever to know when they have found a limit, for even then there might be a great intervening empty space, but farther on possibly another vast field full of these sparkling lights. It is said that it is not probable that these stellar systems go on infinitely, for mathematicians have figured out that if such were the case, the light thrown off from such a number of luminous bodies would light up the whole heavens as brightly as at noonday. What the solution of this question is must remain in doubt, it seems, forever.

Following close upon this comes the thought,

A PHOTOGRAPH OF THE MILKY WAY.

Showing a portion of the myriads of nebulous bodies that make up that great path through the heavens.

Whence Comes the Heat

from the sun and other stars? and where does it go? We have decided quite accurately that meteors and other falling stars do not start out on their voyage through space on fire, but rather are solid bodies which, when they pass so rapidly through the air, are burned up by the heat of friction. Similarly it is thought that the contraction of the bodies of these stars through the gravitation of their parts

creates heat so great that combustion is the result, and when the bodies finally become dense as the earth they grow cold. This theory is pretty well founded upon observations of the sun, and while the conclusion is that this is the proper solution of the problem, yet the process is very slow,—so slow that it would have to go on for thousands of years before astronomers could find by comparing sizes that it had grown any smaller

AN ECLIPSE OF THE SUN.

Caused by the passage of the moon between the sun and the earth.

Though this problem is solved to an extent, where does the heat vanish? is altogether a harder question. What becomes of the flood of heat and light that has gone on at the rate of 180,000 miles a second since the dawn of creation? Science of to-day might say that it continues through space forever. But at such a marvelous velocity it seems that in a few thousand years it should have reached the confines of space, if there be any, and there is no reason why it should stop there. There is a law of conservation of energy that maintains that nothing is lost here on earth: no gas that escapes but that it returns to nature in some form. May it not be true that the heat so long thrown off from our burning worlds may return? We cannot say; it remains a problem unanswered.

If there are these greater questions relative to the whole universe, there are still as interesting ones regarding the worlds we can behold. The question of whether there are inhabitants on any of the planets is still indeed doubtful. We are not sure yet what bodies have atmospheres about them such as that which makes a part of our earth. The moon has been well studied and with many good results, though they cannot apply to the planets and stars. We can see that she has no atmosphere and that there are traces of mountains and craters of extinct volcanoes, but the largest telescopes made will hardly ever be able to aid us sufficiently to discern these qualities with accuracy on the farther planets. It is said that Mars is inhabited, that Venus turns on an axis and has an atmosphere, though cloudy and not transparent like ours. Mars was for a long time thought to resemble the earth very closely, but after years of study, the only resemblance thought to be accurate is what is supposed to be a cap of snow that appears to form over one of its poles in the Martian winter.

The Sun.

With the sun there are still many questions about which the astronomers are worrying themselves. We know a great deal about this body, but when it comes down to facts, the study is still full of wonders. We should like to know what is the cause and what the nature of the spots on the sun; why the sun seems so

calm when the raging fire that is consuming it is beyond our thought. What is the corona, and has it magnetic properties? And is the hazy patch of light in the sky that follows the counterglow of the sun at its setting in the western horizon the tail of the earth, the same as that to a comet?

It seems wonderful that the astronomers can map out so well the time of the occurrence for eclipses and showers of meteors and the like, and to the one not versed in the wisdom of the science it seems as though there were but little more to learn, but such is far from the case. All calculations are not exact: the earth does not always perform its rotations in the same time; sometimes it is faster, sometimes a little slower, though very slight. For half a century the moon will jump ahead of her regular rate, and then again she will drop behind.

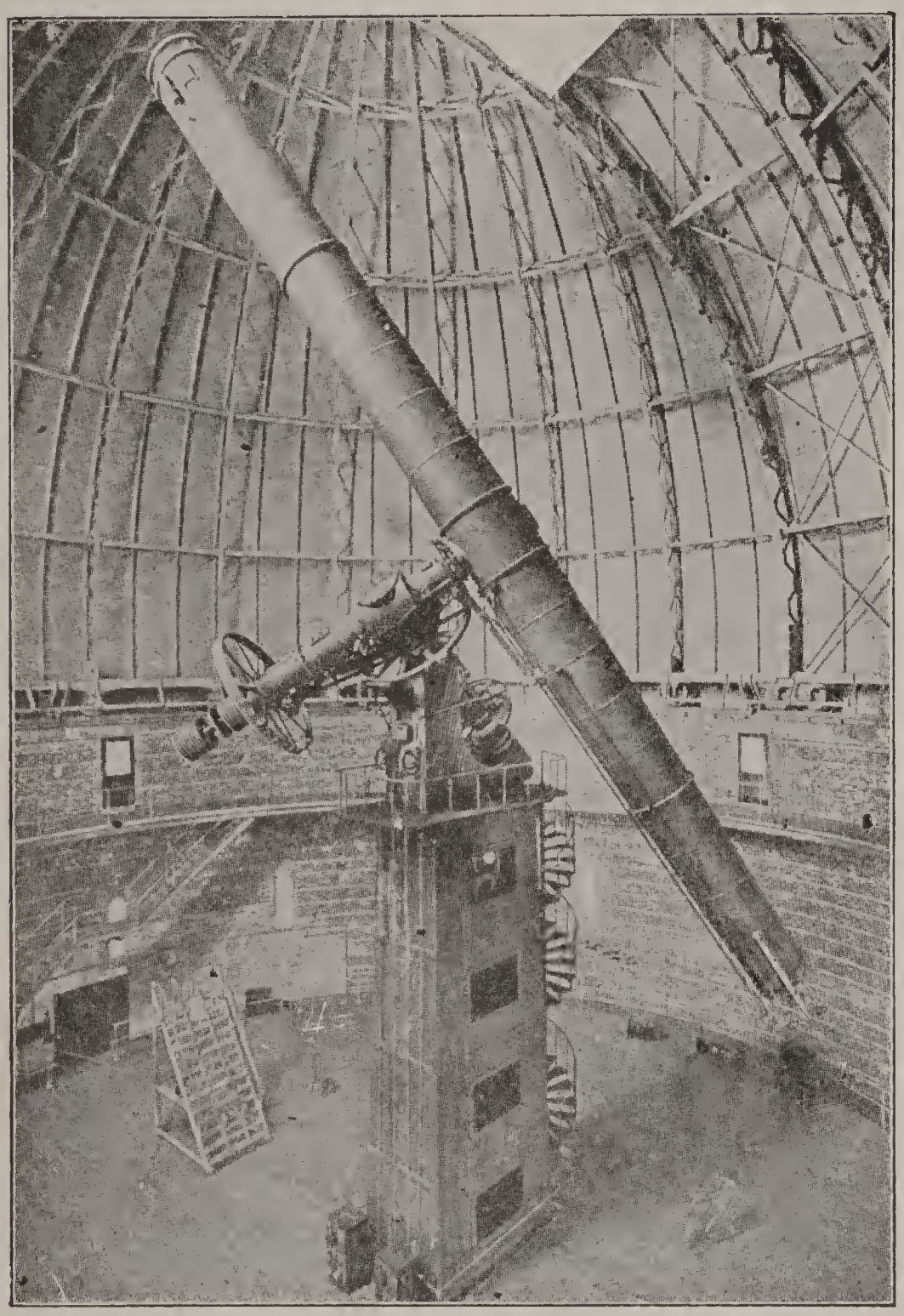
ABOUT PEARY'S GREAT METEOR "NORTHWARD," THE LARGEST EVER FOUND

Forces Are At Work

here and there that we cannot understand, pulling this planet toward another and vice versa. In all it is a science the most exact and beautiful, but far from finished.

Recent photographs of the moon, taken by means of the elbow telescope at the Paris observatory, have led scientists to believe that the moon has still about it

the remains of what was once an atmosphere. Faint traces of this can be found, and when the shape of the moon shows such a similarity to the earth in the formation of its mountains and craters, ocean-beds and streams of lava, it is thought by some that very likely the same conditions once existed there as do at present upon the earth: hence that the moon was once inhabited. Among the recent discoveries in astronomy the novel assertion is made by Professor See that the color of a star varies with its age, being yellow in its youth, and in its old age blue, the tint being a matter of temperature. The bluer it becomes the hotter it is, because great heat causes blue light-waves. Thus, Sirius is a very blue star, and gives out about one hundred times as much heat as the sun, though only perhaps four times as big. When the sun becomes hotter with age, it is argued, it will be bluer, and we shall have blue instead of nearly white light.



YERKES' TELESCOPE: THE LARGEST AND MOST POWERFUL INSTRUMENT IN THE WORLD.

(Tube sixty-five feet long; lens forty inches wide.)

Interior view of Yerkes Observatory, showing the great "lifting floor" at its lowest point. By means of electric motors this floor can be brought up even with the eye-piece of the instrument; electric motors also turn the tube and the observatory dome in any desired direction.

The Largest Known Meteor.

Lieutenant Peary, the great arctic explorer, in tramping through Greenland recently found the largest known meteor, which, in honor of his voyage north, he called the "Northward." It contains much iron, and from this substance the native Esquimaux made many knives and fishing implements. It is many times as large as a man, and weighs one hundred tons.

Yerkes' Great Telescope.

With all the studies that are being conducted in astronomy, let us look at a monster telescope by means of which we are brought nearer the starry skies. Charles T. Yerkes, the street-railway king of Chicago and New York, recently gave to the University of Chicago the newest of the great telescopes. In its observatory on the shores of Lake Geneva, near Williams Bay, Wis., it gives to students the opportunity of making the best examinations of the stellar

systems possible. The huge forty-inch lens of the great refractor is the largest in existence, and it probably marks the limit of size to be attained in the manufacture of the instruments, because any larger size might not give so distinct visions, besides being of such great weight that the large steel tube which holds the several lenses would very likely sag and not be accurately steady. The large glasses in the lenses of this telescope were ground by Alvan Clark, who came from a family of lens makers. The glass proper is composed of two lenses, one of crown glass, the other of flint glass, ranging in thickness from three-quarters of an inch to two inches, and placed eight inches apart. They weigh 500 pounds, and were four years in polishing, the final touches being done by the maker's fingertips. Contrary to common thought, dust does not hinder in the use of the telescope, and no protection from it is placed over the glass. Even a small scratch would not greatly hurt the glass, though of course this is avoided with as much care as possible.

The length of the great tube is sixty-five feet, its weight twenty tons, yet the whole instrument is so evenly poised that it can with ease be moved to any angle or position by the hand. Under the ninety-foot dome, where this monster eye is housed, is a large lifting floor of forty tons weight, that can be brought, by means of electric motors, up to a height even with the eye-piece of the telescope. The great dome is also movable, being placed on car wheels which rest on a circular track, and at the will of the operator the whole affair may be revolved about so that the large opening in the roof may be brought opposite any star. The motive power for the dome is electricity, as it also is for the great sliding shutters for the roof of the dome. Inside the base of the tube is a clock-like arrangement that adjusts various parts of its workings, as well as keeps it moving steadily in the path of the star being studied. The total cost of the huge glass and observatory was a half million dollars, but the outlay produced the most perfect seeing apparatus yet devised by man.

A peculiar incident about the history of the glass is that after Alvan Clark, the maker, had superintended the setting of the lens, he returned to his home in Massachusetts and died the next day.

With this instrument many interesting facts are being learned. It has been learned that a layer of carbon, hitherto unknown, surrounds the sun; the fifth satellite of Jupiter, discovered with the Lick telescope, has now been measured by means of the small spider webs drawn across the eye-piece of this new glass. It has also been ascertained that the earth receives a small amount of heat from the stars Excellent photographs of the moon have been made, and at frequent intervals scientists assemble there from all over the world to make special observations.

Arrangements for photographing with this gigantic camera are numerous. One of the oddest to the uninitiated is that of a set of lenses attached to the outside of the great tube and about forty feet apart. It is naturally supposed that light must be shut off from between the glasses, but such is not the case this time, for all that is wished to be photographed is the object that appears at the focussing point on the eye-piece. Therefore, the only place the light shutter is used is at the end nearest the sky.

A word might be well about the dainty little spider webs used in making measurements with such a telescope. Spiders are kept for the purpose, and in little boxes arranged like lantern slides the webs are strung before the eye-piece, so

that when a star is brought into view a delicate shadow is thrown across its image by these film-like threads. Knowing the space between the meshes of the webs and the distance of the stars, their sizes are computed. These webs are used in preference to any threads that might be manufactured, because of their extremely delicate nature. Another arrangement of interest is a series of colored lights that may be thrown on these webs for telling what the stars are made of. It is well known that certain minerals burn with a certain color, so that by turning on a given light, the light that still shows up from the star can readily be classified and the make-up of the body under observation easily decided.

A MARVELOUS SHOWER OF METEORS

The Great Canals of the World.

PANAMA, NICARAGUA, KEIL, CHICAGO DRAINAGE.

Artificial waterways that will save millions of dollars and make it possible for gigantic ocean vessels to make direct voyages to inland cities and towns which have heretofore been beyond the limits of navigation.

FOR nearly a century after the discovery of America, explorations were made to find the straits that were supposed to exist between the northern and southern halves of the continent. At last, when the Isthmus of Panama was found, engineers at once began to dream of an artificial waterway to link the Atlantic and Pacific oceans. The canal routes that have received the most publicity are those of Panama and Nicaragua. Both of these are under way, though the Panama has expended the more money and is nearer completion. The United States government has interested itself in the Nicaragua plan, and has authorized an expenditure of $115,000,000 on that route.

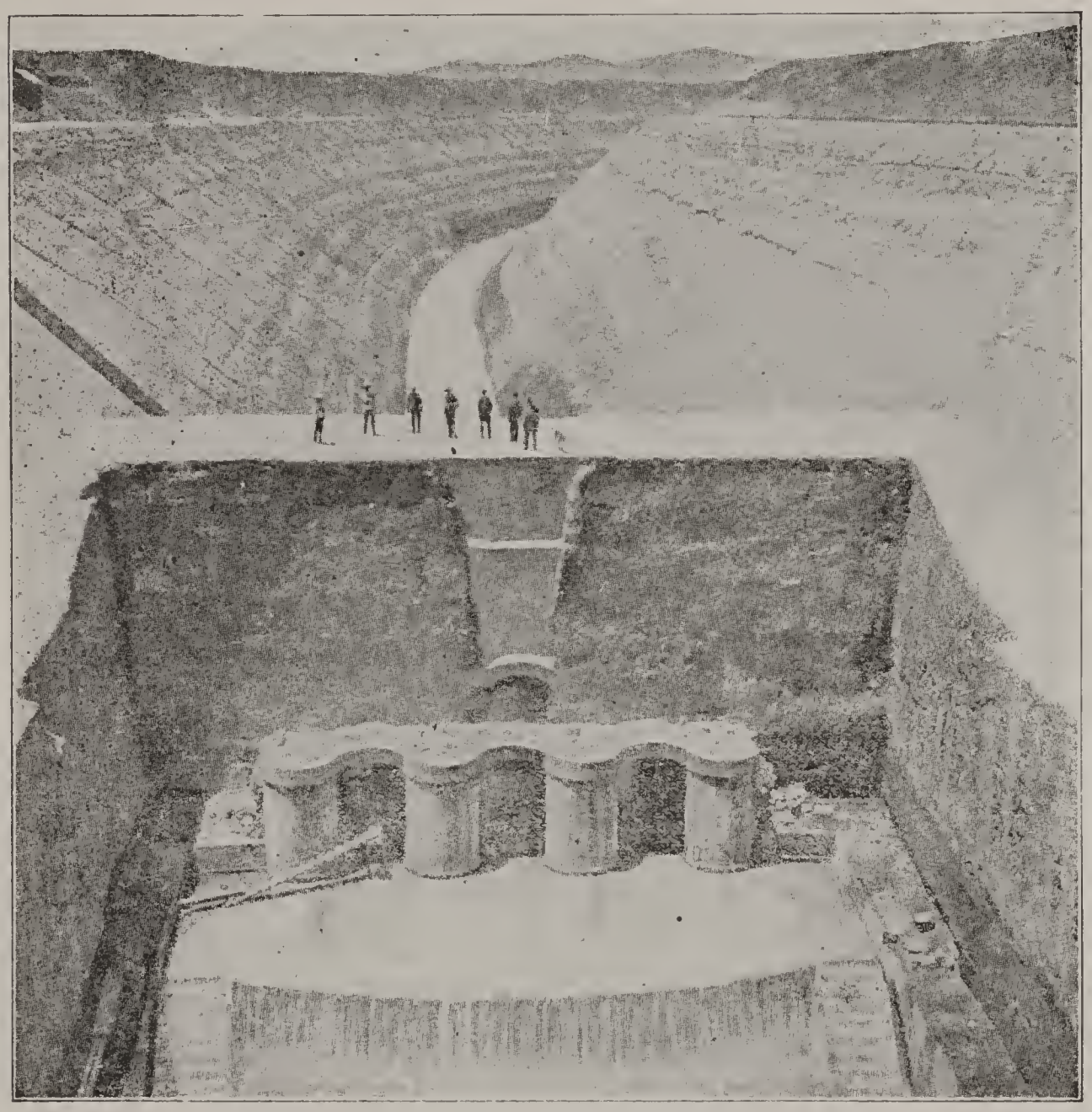
The Panama Route

is already cut two-fifths of the way across the Isthmus from Colon on the Atlantic side to Panama on the Pacific, and the cost of completing it will be about $102,000,000. The route at first lay over twenty-five miles of river, eight miles of the Cordilleras mountains that had to be cut down from 100 to 325 feet, and a great part in bottom lands. Great floods of the Chagres River and the opening up of the damp soil causing sickness necessitated the change of route. Estimates now show $87,000,000 to be necessary for completion, and eight or ten years' time in which to do the work. The route as now laid out is forty-six miles long with the same ports as before, only the Chagres River is not used and in its place canals are to be dug. From Colon fifteen miles is straight cut canal; after that comes a dam which by controlling the waters of the Chagres will flood the country for 13½ miles, with an artificial lake. This lake is to be used as a channel of the canal, and at the other end follows a section of canal five miles long which is the highest of the whole route, sixty-eight feet above the sea. Six locks altogether control the water between the sections, while another artificial lake nine miles north of the main route, caused by another dam, will supply water in dry season.

The Nicaragua Canal,

while well indorsed, is a great deal more difficult task than the Panama, and but a small part of the work has been done. It is to extend from Greytown on the Atlantic, to Brito on the Pacific, using as main channels Lake Nicaragua and the San Juan River. Six locks control the

water, and the hardest part of the plan is to build a series of dams, some of them 6,000 feet long, to check the flow of the San Juan River so that the whole valley will be flooded and make an immense artificial stream connecting with the lake. Short and steep canals are built at each end of the route and connect the lake and river with the oceans. The route is 169 miles long as compared to forty-six on the Panama, while the summit level, or highest point, is 154 miles long, with one end but thirteen miles and the other two miles from the oceans. Should a break occur in one of the Nicaragua locks, half this stretch would be emptied of water and the vessels in transport would be stranded. With both these routes in construction a waterway across the Isthmus is assured before 1910.



OUTLET OF A MODERN CANAL LOCK.

Here is controlled and put to use the enormous power developed by the flow of these great artificial streams.

The Keil Ship Canal.

The great ship canal which is destined to connect the Baltic with the Black Sea, work on which was begun in 1898 by the Russian government, is being pushed forward with the greatest zeal and at the same time with a quietness amounting almost to secrecy. When finished, the work, on account of its immensity and the almost insuperable difficulties to be overcome, will be worthy of a place beside such modern wonders as the St. Gothard Tunnel and the Suez Canal.

The route unites the River Dnieper, which flows into the Black Sea, with the Dwina, which empties into the Baltic Sea at Riga. It starts at Riga, following the course of the Duna River as far as Duneberg, where it is united to the Beresina by means of an immense course cut right through the country. The Beresina and the Dnieper are then used to complete the connection. The total length of the line is 1,600 kilometers, or about 1,000 English miles, 200 kilometers of the entire distance being artificially cut through the land. The work is to be finished in

five years, if all goes well and a sufficient number of men are kept at work during that period.

The canal is about 307 feet wide, and about thirty feet deep, thus allowing the largest vessels means of passing from one sea to the other. Seventeen large ports, or artificial bays, are to be constructed along the line as well, each capable of containing a large number of ships, so that a Russian vessel, however large it may be, may make the entire transit in six days without hindrance of any kind.

The Cost

of the work, at the lowest estimate, and taking into consideration the means at the disposal of the Russian government as to the adoption of unpaid labor, will amount to about $120,000,000. The whole passage is kept within the limits of the Russian Empire, thus allowing Russia absolute sovereignty over the entire course. Putting aside the great political advantages given to Russia by the new enterprise, the gain commercially and economically will be an incalculable one.

Chicago Drainage Canal.

One of the greatest enterprises in the line of canal building has just been finished by the Sanitary District of Chicago, and consists of an artificial waterway connecting the waters of the Chicago River with those of the Mississippi. For years the filth of the Chicago River has been such as to give the stream the name of "sewer." The refuse from numerous factories emptied into it, and in heavy weather or after a thaw these waters flowed far out into Lake Michigan, from which Chicago gets its water supply, thus being a great menace to the health of the inhabitants. The opening of this canal effectually turned back the waters of the river from its mouth and made the stream flow towards its source. Virtually Lake Michigan thus has an outlet to the Gulf of Mexico, the water flowing steadily up the river and out through the cut that joins the river at its south branch, and over a rocky bed and between stone walls to Lockport, Illinois, where a great controlling dam is situated that lets the water into the Des Plaines River. From this point the water runs by way of the Des Plaines, through the town of Joliet, to the Illinois River, and thence into the Mississippi. The canal is 160 feet wide, is made of six-foot thick masonry, and is deep enough to admit ocean vessels, while it has a capacity of 600,000 cubic feet of water a minute. Part of the route lay along clay beds, and here the work of construction was the easiest; elsewhere it lay along solid rock, and here blasting had to be done; another part lay along a prairie, and there a wall of stone thirteen miles long had to be built.

To remedy the sewage problem of Chicago the whole sewer system had to be reversed, and the refuse matter made to flow out to the canal instead of into the lake as heretofore. To do this large intercepting sewers were constructed underground, connecting the larger sewer mains and emptying into the south branch of the river. It took seven years to construct the canal, and about $32,000,000 were expended. The money for this was raised by taxes, but a large income will be derived from the use of the power developed by the fall of the water over the dam at the big controlling works at Lockport.

The Stupendous Power of Niagara Falls.

FIFTY THOUSAND HORSE POWER DEVELOPED FROM THE WORLD'S GREATEST CATARACT.

THE Niagara Falls are now being used to operate great electric dynamos for generating power for many factories in their neighborhood. The waters of lakes Superior, Michigan, Huron and Erie empty into the Niagara River, which after leaving Lake Erie flows swiftly for two miles and then widens and separates above Grand Island into two branches. These come together again below the island, and flow slowly about several islands till their combined waters reach the "rapids" about a mile above the falls. The flow of water here is 275,000 cubic feet a second, or half a million tons per minute. This enormous flood was first utilized for power in 1725, when a small saw-mill was erected near the falls and run by its force.

The Niagara Falls Power Company recently made cuts in the river a mile above the American Falls. Water is led in from the "rapids" by a canal 12 feet wide and 180 feet long, with capacity of 100,000 horse power, to a wheel pit 30 feet wide by 200 feet long and 180 feet deep. Eight steel penstocks restrain the water in its plunge down to the bottom of the wheel pit, and at the base of each is a 5,500-horse power vertical turbine. The shaft of each turbine is attached at the upper end to a 5,000-horse power generator, which gives the plant a total capacity of

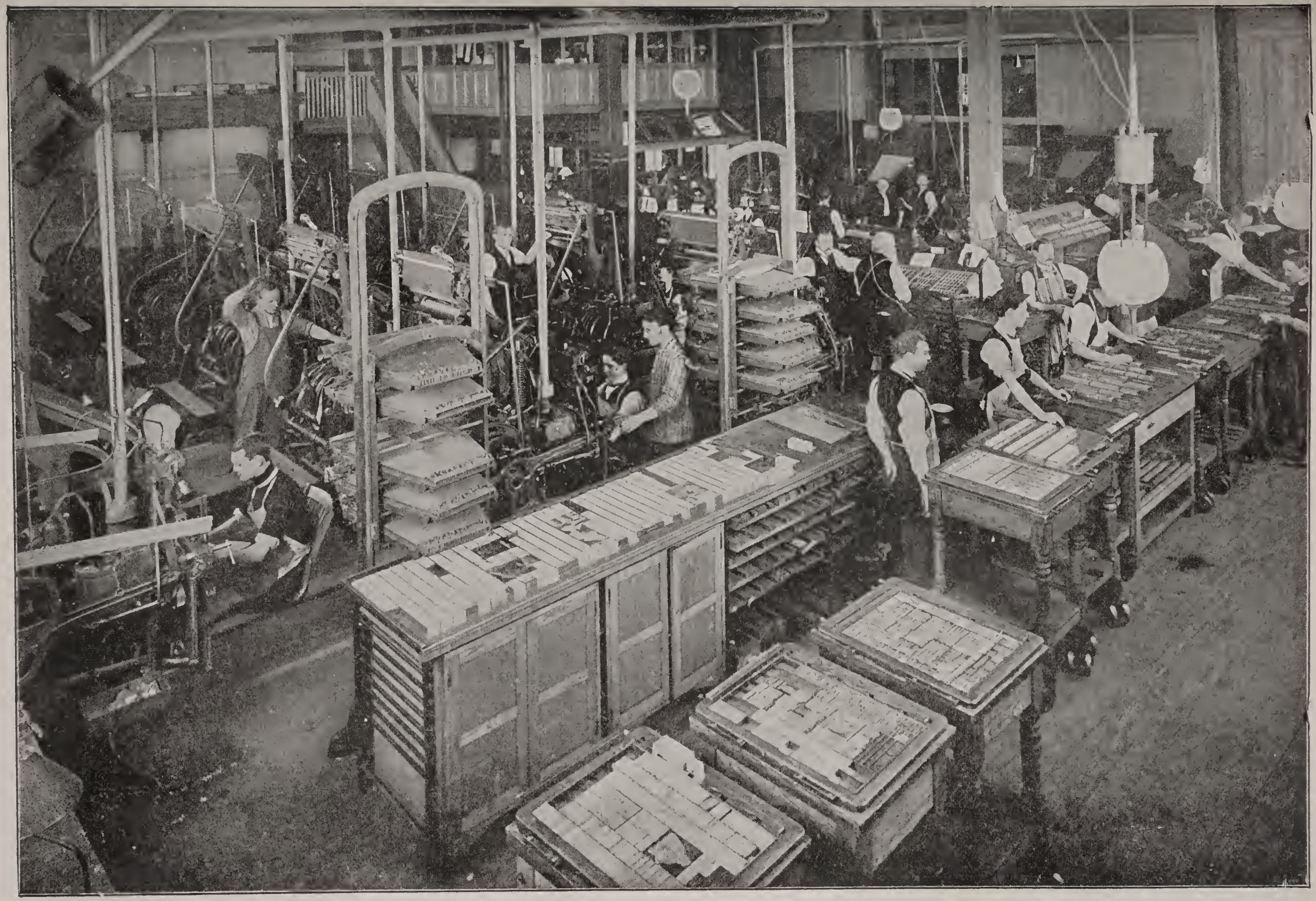
40,000 Horse Power.

Provision has been made for two more turbines and for another house to be built on the Canadian side. From the wheel pit the water runs through a tail-race 7,000 feet long directly under the town of Niagara Falls to an outlet at the base of the cliffs.

The Niagara Falls Paper Company uses 7,200 hydraulic horse power from this same point, taking it from the canal before it reaches the penstock.

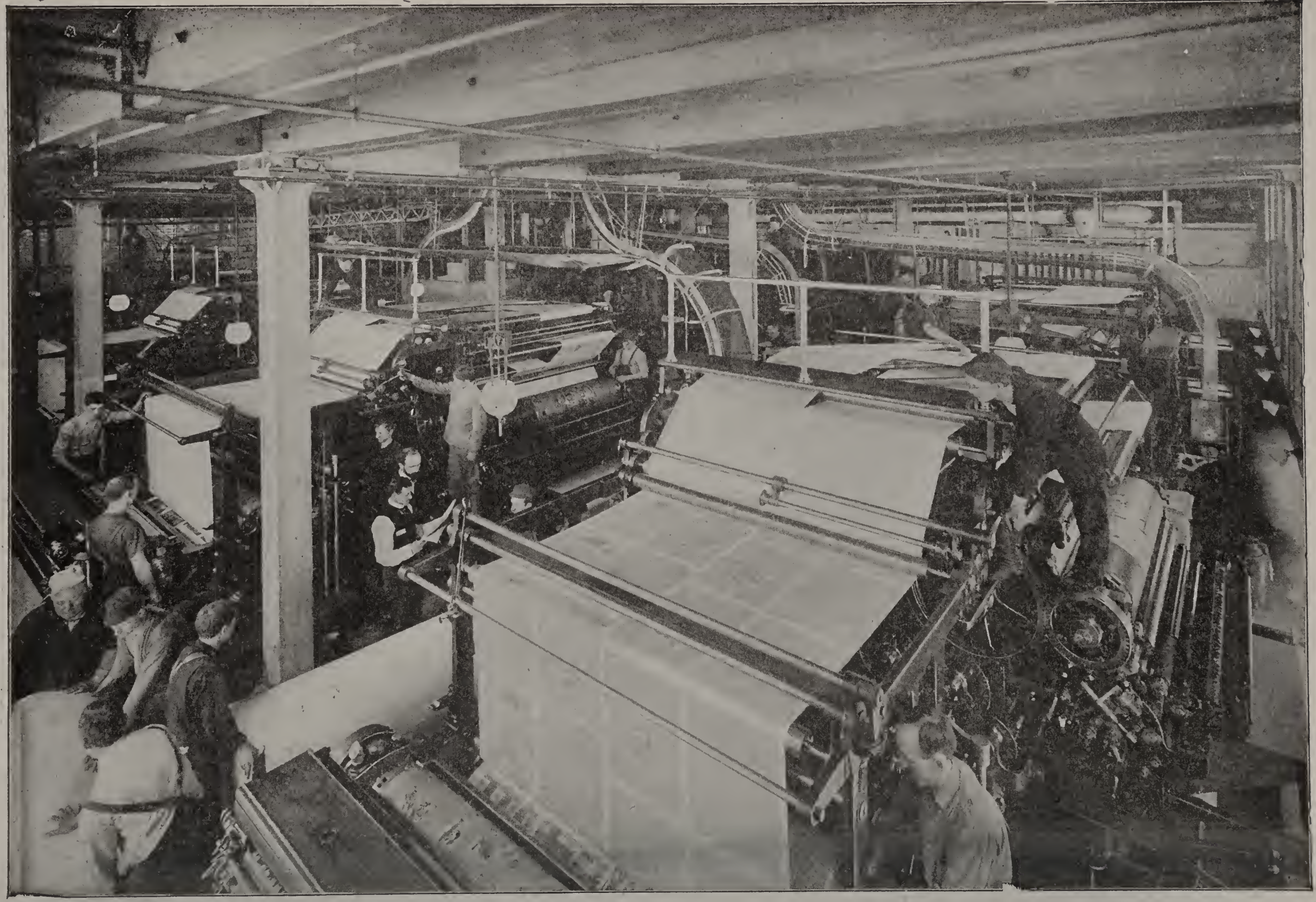
Another plant, operated by the Niagara Falls Hydraulic Power Company, takes in water from the rapids 2,000 feet below the other intake, and runs a canal through the town to the edge of the gorge, where two penstocks, eight and eleven feet in diameter, take the water to a power house 200 feet below at the edge of the river. Here horizontal turbines develop energy to about 20,000 horse power. An old canal built in 1858 also supplies about 7,500 horse power. On the Canadian side the Niagara Falls Park and River Railway operates a power house with two turbines, and generates 2,000 horse power.

The theoretical power that is possible from the Falls is that of 7,500,000 horses, of which, however, less than 50,000 is being developed and put to useful account.



THE LINOTYPE AND "MAKEUP-ROOM" OF A GREAT DAILY NEWSPAPER

IN THE BACKGROUND ARE SEEN THE LINOTYPE OR TYPESETTING MACHINES AND THEIR OPERATORS. IN THE FOREGROUND TO THE RIGHT ARE THE TYPESET PAGES OR "FORMS" OF THE PAPER



THE HOE QUADRUPLE PRESSES IN THE PRINTING OFFICE OF A LARGE DAILY NEWSPAPER

TO THE LEFT ARE HUGE ROLLS OF PAPER READY FOR USE. IN THE CENTRE-FOREGROUND IS SEEN A PRINTED PAPER COMING FROM THE PRESS, FROM EACH PRESS CURVING UPWARDS THROUGH THE CEILING, ARE TROLLEYS FILLED WITH PAPERS READY FOR DISTRIBUTION

STUDENTS OF DECORATIVE PAINTING AT WORK—SCHOOL OF INDUSTRIAL ART, PHILADELPHIA

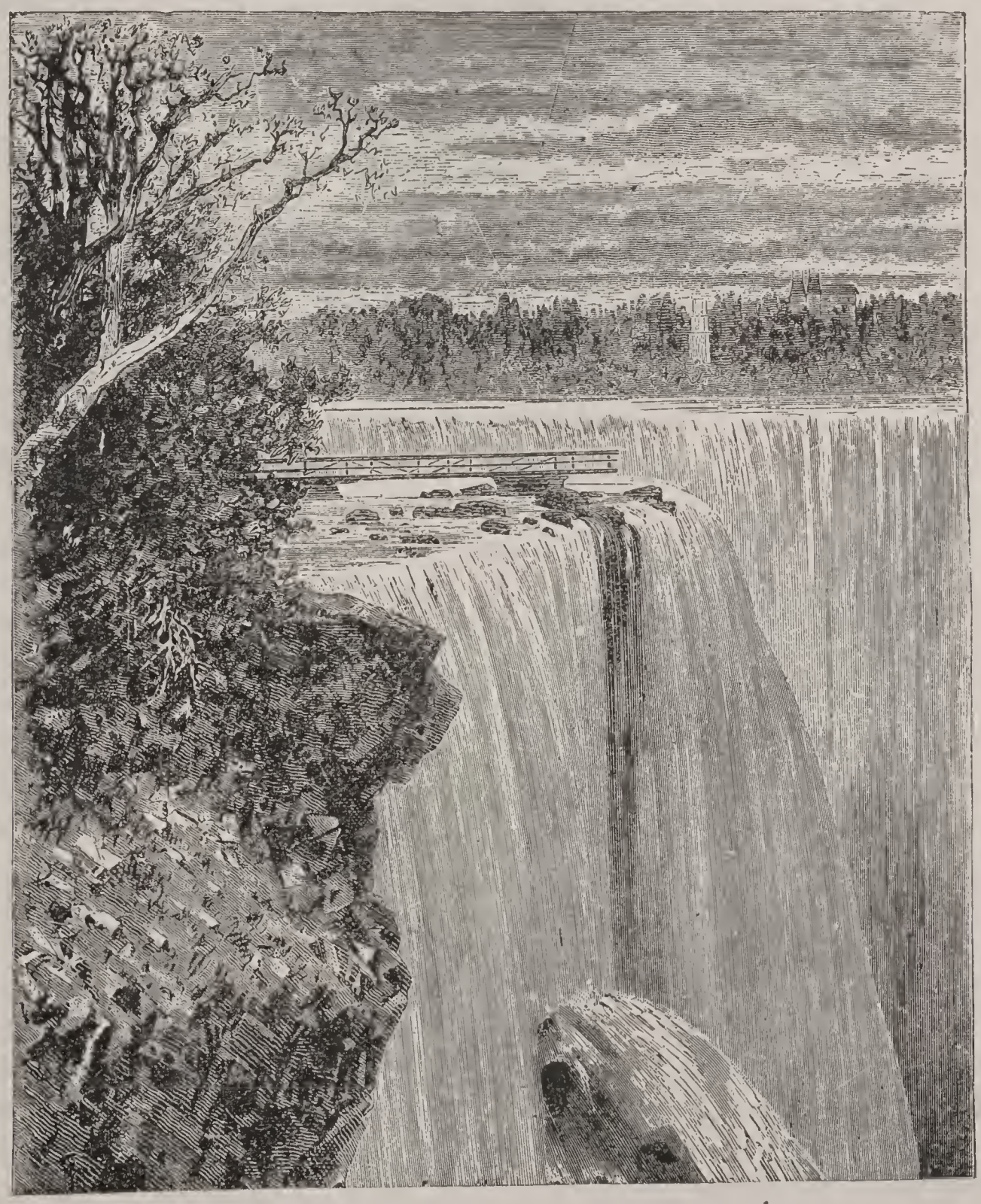
THE YERKES OBSERVATORY ON THE BLUFFS NEAR LAKE GENEVA, WIS.

IT IS CONNECTED WITH THE ASTRONOMICAL DEPARTMENT OF THE CHICAGO UNIVERSITY, AND CONTAINS ONE OF THE GREATEST TELESCOPES IN THE WORLD, DONATED TO THE UNIVERSITY BY CHARLES T. YERKES, AT A COST OF OVER HALF A MILLION DOLLARS

The Turbines

that do the work of generating power are arranged in pairs. Each is attached to a 13-foot diameter inlet tube. Two large revolving bronze wheels receive the water, which has first been governed by pressure gates, and led into the wheels by draught tubes, which are so arranged as to keep the dampness out of the machinery. The turbines are 70 inches in diameter, and have 36 blades, each one of 142 square inches and highly polished so as not to give resistance to the water. The axis of each of the great wheels is 11½ inches in diameter, and they are all mounted on ball bearings. Each turbine revolves 250 times a minute.

Industries using electric power for manufacturing paper, aluminum, carborundum, calcium carbide, and other chemical industries, street railways of Niagara and a railway of twenty-two miles to Buffalo, are all being operated by this great power generator. Buffalo alone takes 6,000 horse power. It was at first thought that the electricity thus generated would sometime be taken great distances for power purposes, but the tendency is more for industries to move near Niagara than to transmit the power



THE WORLD-RENOWNED NIAGARA FALLS

The Cinematograph—Moving Pictures.

Reproducing, by means of the camera, the motion of moving objects as well as the objects themselves. A wonderful accomplishment which science in the time of our fathers would have scoffed at as impossible,—to-day an absolute fact.

TO THE person viewing for the first time the flitting pictures projected from a moving-picture machine to the large magic-lantern screen where they reproduce accurately every phase of life in rapid motion, there is something very weird and fascinating. When one knows, however, the means by which this extremely odd and interesting feat is accomplished, he simply learns that another great improvement has come about in this age of invention.

The first phase of the moving-picture study was that of the invention of the

"Zeotrope."

This was a toy in the shape of a wheel-like disk. On the back were painted a number of figures, each one in a stage of motion a little farther advanced than the one before it. Under each picture was a narrow slit, so that when a pin was run through the center of the disk and the picture side of the zeotrope held nearest a mirror, the person using the toy might squint through the slits as they passed by when the disk was whirled around. The general effect thus seen through the slits reflected on the glass was that of the object going forward by jumps, a great deal like real life. Since the artist had to draw upon his imagination in painting the pictures, they were often incorrect in attitude, therefore as the disk spun around some very grotesque methods of locomotion were the result.

This, however, was but the start of a series of experiments which later brought to perfection the present motion pictures. Some years later there appeared an invention which brought to light the main principle now used in the best machines, namely, the passing of a strip of pictures behind the lens of a lantern, the device having a shutter which cut off the light for a short interval, as a new picture was moving into place, and again opened to allow the passage of light as the picture paused an instant before the lens. All experiments have since been conducted upon this system of jerking pictures through on strips, letting them pause for a moment before the light, then shutting off the light and then again going through the same operation.

The question now came as to how correct pictures might be obtained to place on these strips. When instantaneous photography became a fact, a man named Muybridge, of California, tried the scheme of placing a number of cameras in a row

along a road where he trotted a horse, and as the horse was in front of each camera the respective shutters were set off automatically. The result was his famous "Trotting Horse," which for some time astonished the public in its lifelike motions. But it is apparent that the cameras had to be placed so far apart that the jump from one picture to the next was too great, especially if the machine reproducing the pictures was moved very rapidly.

The Kinetoscope.

Then came Edison with his famous kinetoscope, by which he took series of photographs on long strips of film at the rate of some thirty a second. After this process the rest of the work of perfection was simply that of mechanical contrivances, the principle remaining the same.

The systems in all the different motion-picture machines are very similar, though there are nearly as many names as machines. First, photographic films are prepared on strips of gelatine, varying in length from seventy feet to six hundred feet. These strips are sensitized the same as a photographic plate, and are wound in convenient spools. The object is to pass this strip of film through a camera at the point where the plate is usually placed, or the focal point, unwind the roll bit by bit, have a tiny section an inch long stop still in front of the lens of the camera for a short fraction of a second, then have a shutter cut off the light, and the roll proceed till the next inch is before the lens. When the light is on again, another exposure is made, and so on till the whole strip of film is used up and about a thousand pictures have been made, all in the space of a little over a minute. This process requires a delicate mechanism, for the film must stop before the lens just during that fraction of a second that the shutter is open, and the shutter must remain closed while the next bit of film is moving into place.

After a series of pictures have been exposed, the strip of film is taken to the dark-room and developed. To handle a roll of flimsy gelatine seventy, a hundred, or perhaps several hundred feet in length is no small task, but devices have been arranged for keeping it on a windlass and unwinding and developing a short length at a time, or winding it on frames with pegs on them, so that the whole piece can be developed at one time. After the film is dried another film is placed over it and another exposure is made, only this one is a positive, whereas the other was a negative,—that is, in the negative all the white objects were black, and the black objects white, but in the positive they are their proper colors. Now, after the positive has been dried, it is ready to be passed again through the machine, which is, however, this time fitted with a powerful light of some kind, similar to that in a magic lantern. The film is unwound and the shadow is cast by the light through the lens upon the white screen; then the shutter cuts off the light, the next picture moves into place, and the light throws another picture. The pictures move about fifteen to the second, that is, almost the same as the animal moves in real life. By a peculiar phenomenon, called "persistence of vision," we retain upon the retina of the eye the image of what we have seen for even a short fraction of a second after we have shut our eyes, or the light has been cut off. This may be explained by looking through the fly-wheel of some large engine. The spokes keep cutting off the vision, yet the only result is a haze over the object beyond. Well, this is what enables us to view these motion pictures, for as we gaze at one picture it becomes firmly impressed

upon the retina of the eye, and stays there long enough for the next picture to be moved into place. Thus we experience the effect of a continuous motion instead of a series of pictures, though there is a jerky sensation that it will take some time before the inventors can do away with.

Pictures may be colored and made more lifelike, though this is not often done. As yet these motion pictures have not been placed to much use beyond that of amusement. It is helping in some studies, however, such as that of anatomy. Pictures of operations may be made and afterwards shown to the class. At present we have all sorts of subjects, from athletic contests to naval and land battles; from scenes in the nursery to the flight of birds or the thundering advance of the fast locomotive.

The White Man's Greed for the Land of the Blacks.

CIVILIZATION IN AFRICA.

THE scramble for land in Africa by the nations of Europe is of comparatively recent date. Earliest explorations were begun in 1553, and while the continent has held more of romance and danger for the explorer than possibly any other, it has been a hard task to colonize it. France and England, as in other things, have been constant rivals here, with England in the lead. Country after country has pushed into the interior at different points along the coast, and gained control of the native chiefs. Generally the partition went on gradually and peacefully, and it was not till after the Brussels Conference in 1878 that the unrestrained scramble began that has since resulted in the division of the whole continent among the great powers. In 1876, while Great Britain, France, Spain and Portugal had located colonies on the coast, the interior was largely held by wild tribes, but since then the work of division has been so energetic, that in 1890, of the 11,900,000 square miles of territory on the continent, only some 1,500,000 remained open for further conquest. Conflicting claims have existed all along between the powers, and it was through these mainly that France had trouble with England at Fashoda, in which the latter country came out victorious, and which keeps England's army in the Soudan. The recent trouble with the Boers in South Africa will very likely add to the possessions of Great Britain, while France is daily getting a stronger hold on Madagascar. The following is the area as controlled by the different powers, omitting such as has over it only a protectorate government: Great Britain, 2,250,000 square miles; France, 3,500,000; Germany, 890,000; Portugal, 900,000; Italy, 600,000; and Spain, 250,000. Besides these possessions there, the Congo Free State controls 850,000 square miles; Liberia, 37,000; the Boer republics, 162,640, and unappropriated territory, 1,500,000.

Scientific Farming.

FOREST WASTE: IRRIGATION: PREVENTION OF FROSTS:

Congress investigating and assisting in agricultural expansion, making it possible to grow grains and fruits in what was formerly a barren waste.

YEAR by year the United States government is striving to aid the farmer and land-owner by scientific work through the Agricultural Department. One of the greatest problems before the department, and before the whole country in fact, is the waste of timber, the denudation of forest land and the resulting floods that ravish the countryside in the spring, only to be followed by long droughts in the hot season. The making of paper is of course a necessity, but the rate at which timber cutting is going on for building and for making paper pulp is astounding. The people of Maine have complained, but they are not the only ones who are becoming anxious over the depletion of our great forest lands. The devastation is enormous, and the waste is equal almost to the amount used. A substitute is desired for paper pulp, and the Legislatures are taking up the question. Cornstalks have been used with some success, and some relief seems in sight.

Congress, in the fall of 1899, sent a

Commission to the Head-Waters of the Mississippi

which looked over the ground in Minnesota for the purpose of establishing a national forest reserve and game park. The possibility that the vast cuttings of timber at the head of these waters might threaten this mighty stream has caused this action of Congress. The forests keep the moisture under their roots and allow it gradually to seep through continuously in all seasons. When trees are cut down it leaves a barren tract of land, over which in rainy seasons the waters pour in gullies to the rivers. Disastrous floods follow, but as soon as the rain ceases, as harmful droughts take their place.

While forestry has become a living issue in the fertile Atlantic and Northern States through the depletion of perennially flowing springs and streams and increased flood action, and probably by greater and increasingly injurious extremes of frost and heat arising from forest destruction, in the West and Southwest successful forestry is to be the saving of the country. Vast stretches of arid land await development, and what good timber land there is will be saved at all hazards. The covering of the mountain sides must be respected, though of course old trees may be cut as young ones grow up.

Another method for

Reclaiming the Bad Lands

is to find crops that will grow in arid soil. Brome grass and broom-corn millet are

being tried with great success. This possibly is an easier way for the individual farmer than irrigation ditches. After fairly good crops of these grasses are raised for some time, the conditions naturally improve greatly. In many cases springs are developed, the grass sod holding the water in the hillsides.

Another method for helping the agriculturist is through the Weather Bureau. Daily signals are sent all over the country warning against approaching storms. It is the study of this department to avoid as much as possible the bad effect of drought and flood, and particularly of frost.

The most effective prevention again

A CALIFORNIA JACK-RABBIT DRIVE—RABBITS ENTERING CORRAL.

In the west the country is so infested with jack-rabbits that the whole community rises to drive the pests in an ever-narrowing circle that at last ends in a corral. Here they are leisurely shot or killed with clubs.

Kaffir corn is an example of what can be done in this line. Ten years ago this plant was an experiment in the United States. It was said to thrive in ground too dry for Indian corn, and was tested in western Kansas. In 1898 Kansas raised corn of this kind to the value of $5,688,380,—a reclamation of half a million acres of land in a single State.

heat radiation that induces frost is by means of glass screens, which possess the peculiar properties of allowing the heat to come in from the sun, but are almost impervious to the "dark" heat rays reflected from the earth and plants. Lately, in California, muslin screens stretched on poles above the tops of the trees have protected whole orchards. In

Florida, houses of laths are made with openings at the top the width of a slat. When placed in the proper direction so as to receive the sun but gradually in the morning, the fruit trees thrive, for at night only partial radiation of heat takes place. Sometimes crude petroleum or tar is burned near the trees, so that great clouds of smoke are produced that rival atmospheric clouds. This produces conditions that will not allow frost. To quote Professor Garriot of the Weather Bureau, "The amount of heat produced from burning one sack of wet straw weighing fifty pounds, and condensing water vapor near the earth, would be sufficient to raise the temperature twenty degrees in a space of seventy-five feet square and twenty-five feet high. If only one quarter of this heat remained within the region to be protected, which would seem to be a reasonable estimate, it would afford ample protection for almost any ordinary conditions."

Spraying and Sprinkling Plants

has been effectual in preventing frosts. In California, during threatening seasons, sprinklers are placed at the top of fifty-foot poles, which fill the air with fine mist. The owners of the ranch using these claim they have proved very successful in saving crops. In France frost bells are rung to warn the vine growers when frost is expected, and they immediately pour tar on the ground near the vines and set fire to it. In Louisiana and Florida water ditches are run between rows of trees. During threatening weather the water gives off heat as it passes along, thus warming the surrounding atmosphere and saving severe freezes.

THE BUCKEYE MOWER AT WORK

DISCOVERIES IN THE ART OF HEALING

THAT HAVE REVOLUTIONIZED MEDICINE.

Curing by Light Rays; Artificial Skin and Bone, Germicide, Etc.

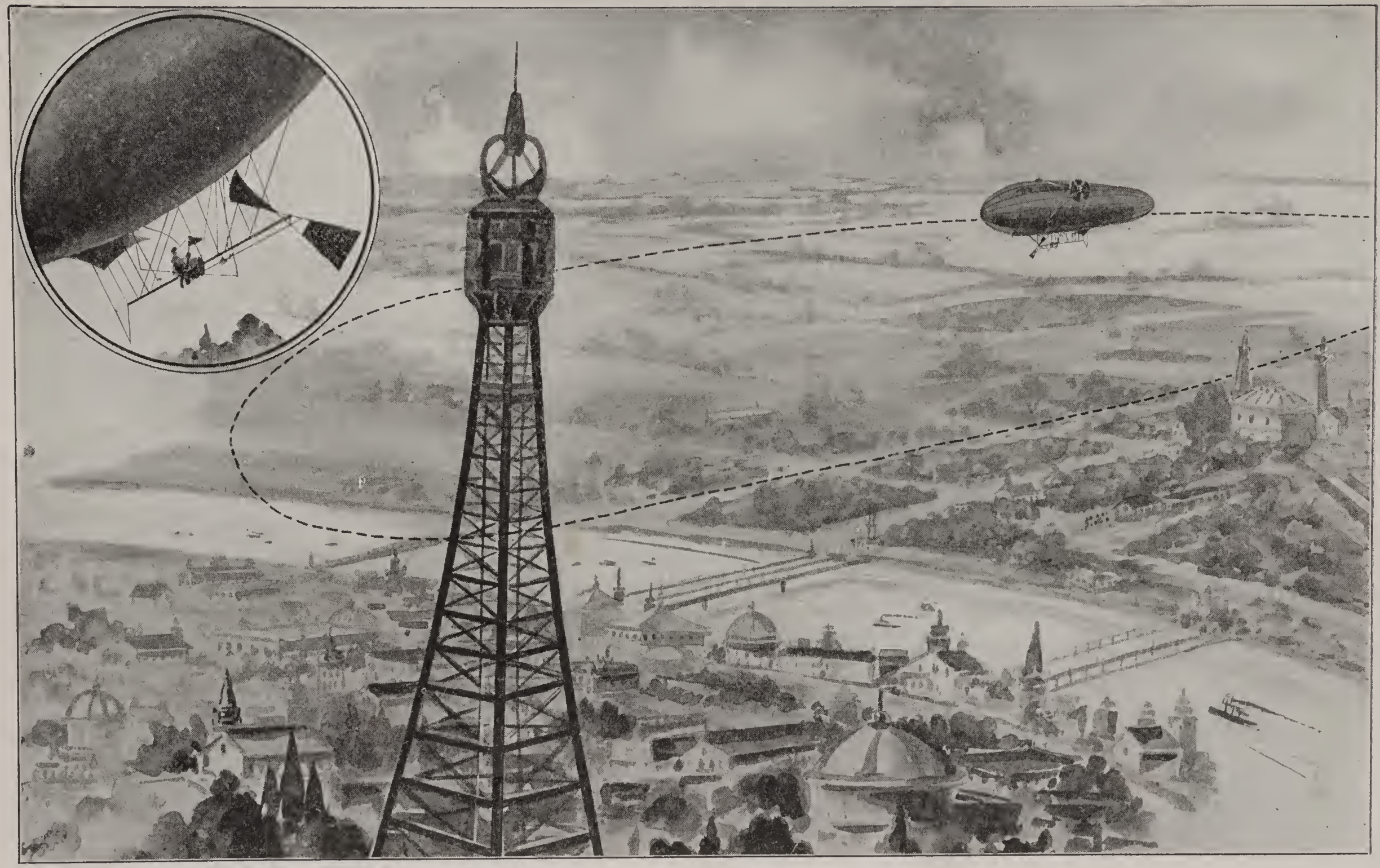
MANY diseases and injuries which a few years ago were considered incurable and always resulted in death are to-day successfully treated by the masters of medical science. Thousands of persons to-day owe their lives and healthy phys ical condition to the last decade's progress in surgery.

With the recent experiments in treatments for disease by electricity, X-rays, the Finsen violet light, and Pasteur serums for plague microbes, the world of science is fast advancing upon the diseases that flesh is heir to. Most scientists are coming around to the belief that a vast number of ailments commonly attributed to various or unknown causes all have their origin in microbes or bacilli,—tiny animal natures that feast themselves upon the tissues of the human body. With this thought in view, they have steadily sought out the particular germs of certain diseases, with the result that many have been classified The next study was to find some remedy that would effectually chase these intruders out of the system. At present scores of microbes have been found, some that cause one disease, others that cause others. Thus tuberculosis, or consumption of the lungs, diphtheria, plagues, cancers, and yellow fever, each has its own peculiar bacillus, and physicians are daily searching for more and surer enemies to these little pests.

Light in almost any form and pure air are very beneficial in these diseases, being deadly enemies to most microbic organisms. Consequently scientists are searching through these media for the desired remedies, and yet in some cases air on a sore surface aggravates the trouble. Dr. Murphy has recently invented a process for the treatment for consumption in which he pierces one lung by means of a small hollow needle. Through the aperture of the needle he admits a quantity of gas which collapses that lung in its diseased part. When the tissues of the lung come together they scarify or grow into one piece, and though the lung is smaller than at first, it is cured; and after a few years the constant exercise of the lungs tends to develop them to their former size Dr. Murphy was also the inventor of the famous "Murphy button" for piecing together severed intestines.

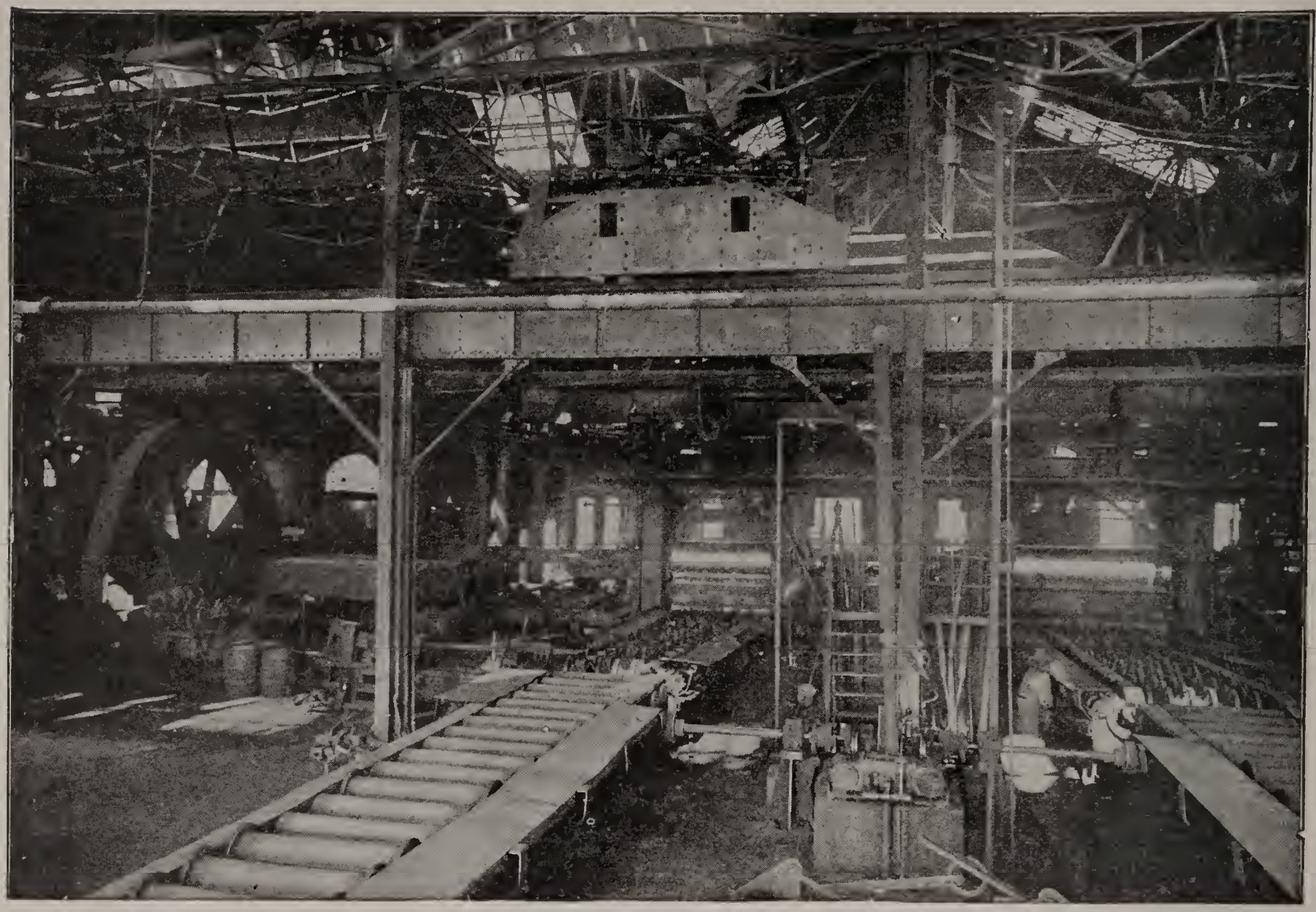
Cures by Liquid Air.

Liquid air, though in its crude stages for surgical uses, is yet hailed as a great boon to man. There is not to be found any other means of producing such intense cold, and the effect upon animal tissue of this strange property of air is nearly the same as intense heat, though no blister is occasioned. In cauterizing wounds, in removing foreign growths and killing putrid flesh, this method is sure and has few evil after effects. It



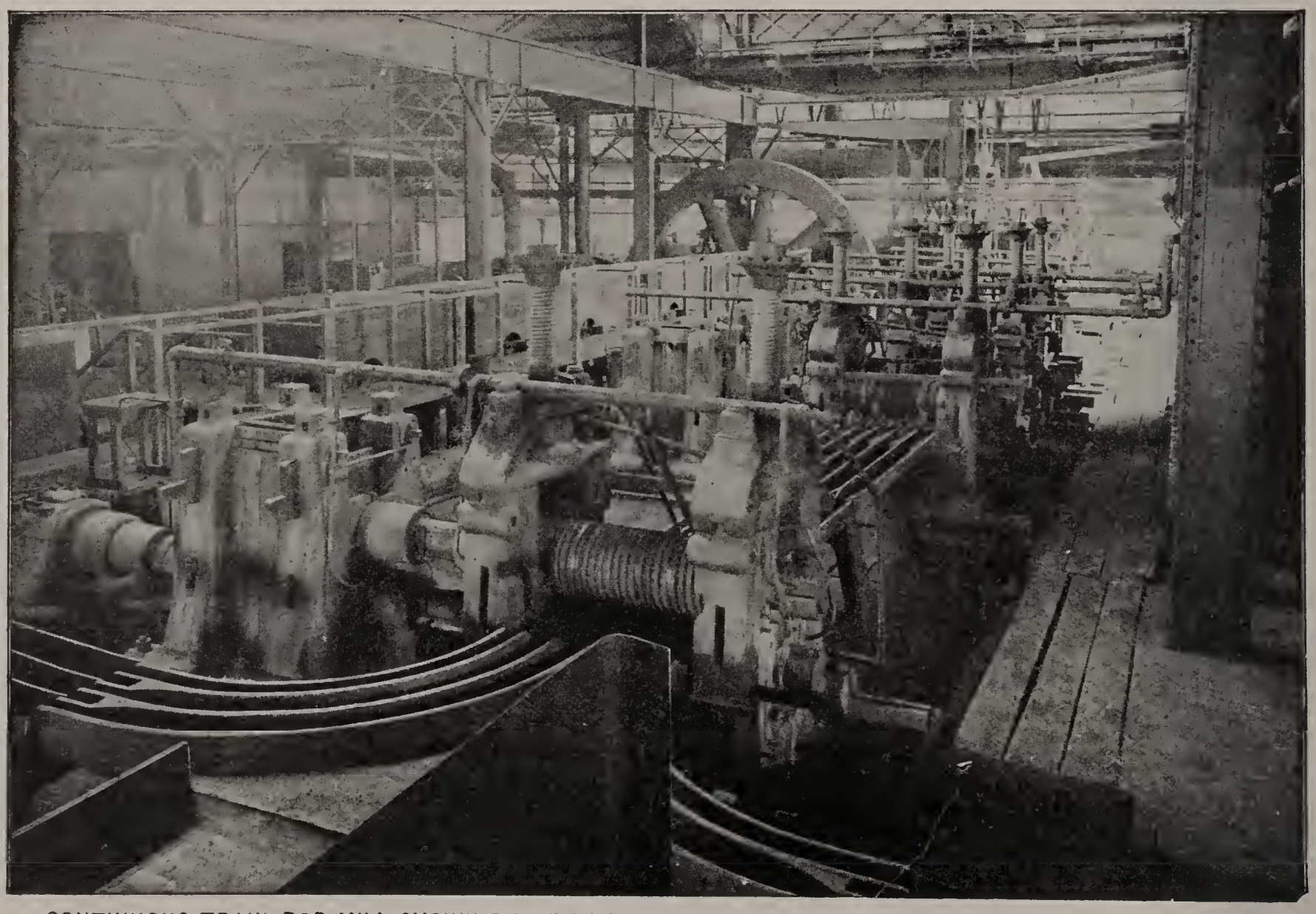
M. SANTOS-DUMONT'S FAMOUS AIRSHIP

THE ENGRAVING SHOWS THE AIRSHIP SAILING AROUND THE EIFEL TOWER IN PARIS AT A HEIGHT OF 700 FEET. THE LENGTH OF THE AIRSHIP IS 103 FEET; DIAMETER, 11 FEET; PROPELLOR SCREW OF 16 HORSE-POWER MAKING 200 REVOLUTIONS A MINUTE.



STEEL PLATE MILL

SHOWING IN THE BACKGROUND THE IMMENSE ROLLERS THAT PRESS THE WHITE-HOT STEEL INGOTS OR SLABS INTO IMMENSE STEEL PLATES FOR THE HULLS OF VESSELS, LOCOMOTIVES AND OTHER USES



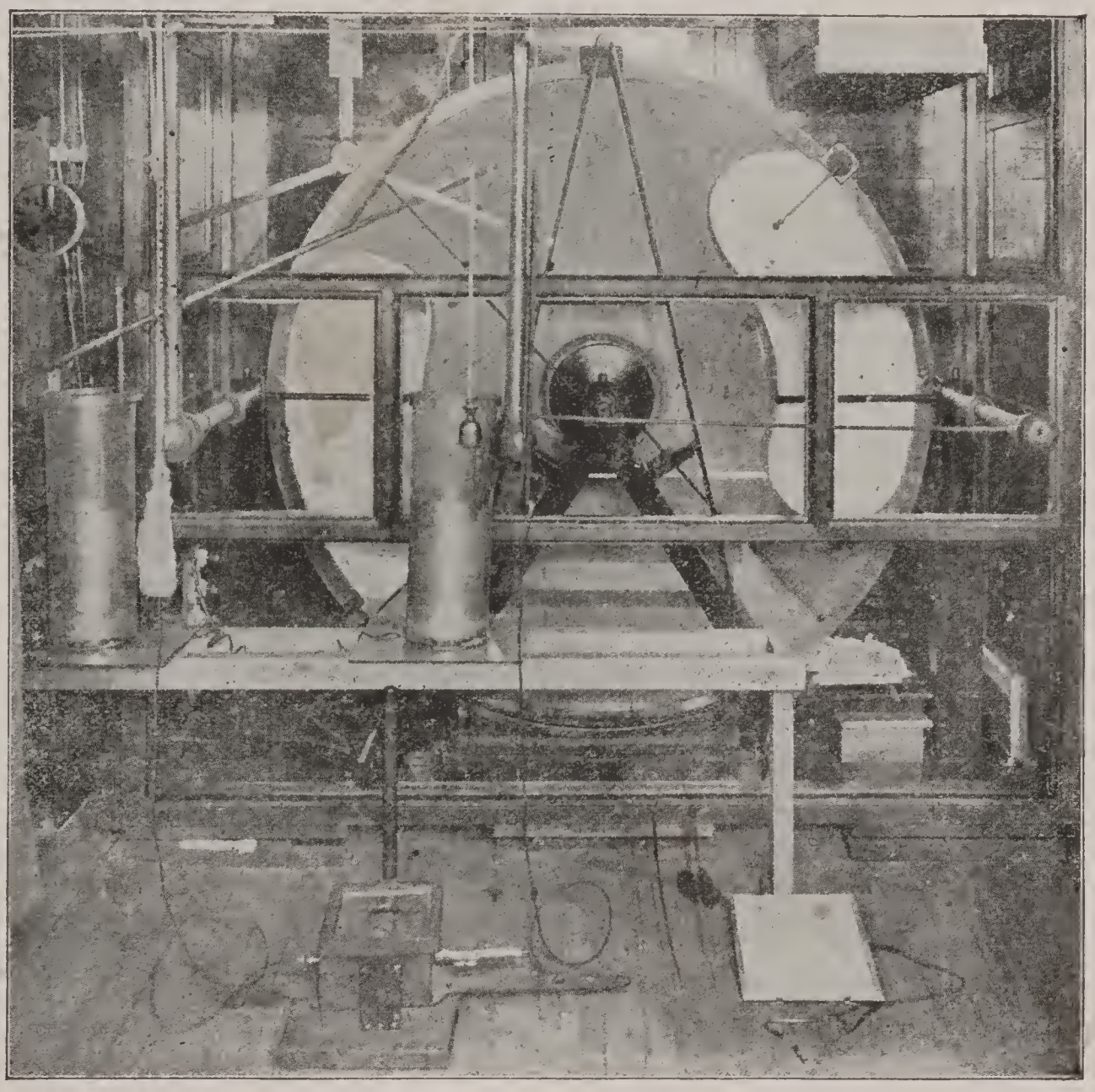
CONTINUOUS TRAIN-ROD MILL SHOWING THE IMMENSE ROLLER THAT PRESS THE IRON INTO LONG RODS

cures corns, warts, boils, ring-worms, ivy-poisoning and ulcers, forms of rheumatism and neuralgia, kills typhoid fever germs, as well as diphtheria, and in part supplants the surgical knife. It has been used with success for eating out ulcers, and recently a case of facial erysipelas was treated by rolling a glass bulb filled with liquid air over the inflamed tissues, with the result that the heat subsided and the patient was entirely recovered.

Finsen Light Cure.

Probably one of the greatest discoveries of recent years in medicine has been that of Dr. Finsen of Copenhagen for the cure of skin disease by subjecting the affected parts to strong violet rays of light. It is well known that such maladies are caused by bacteria, and when light in concentrated violet hues is cast upon diseased tissue it has been found that the bacilli are killed and the skin becomes healthy again.

The bactericidal property of light had previously been proved. Investigations at the Finsen Laboratory showed that that property, instead of residing in light as a whole, was peculiar to the chemical rays. These rays have a power to irritate the skin and to penetrate it. He exposed a specimen bacillus to bright sunshine in July, and found that the rays killed it in an hour and a half. The light from an electric lamp did the same work in about eight hours. It was learned that when



A HUGE STATIC ELECTRICAL MACHINE FOR X-RAY WORK.

Diameter of revolving plate, 6 feet; of fixed plate, 6 feet 4 inches.

the skin was full of blood it was harder for the light to penetrate. This was proved by fastening a piece of sensitized photographic paper behind a man's ear and placing him in the sunlight. After a considerable exposure the paper was unaffected. When the ear was afterwards pressed so as to squeeze the blood from it an exposure of twenty seconds turned the paper black.

Now, as soon as Finsen had learned that the blue rays of light had the properties of killing disease germs, he set about devising a method for its practical use. The result has been a set of lenses between which is a bright blue, weak, ammoniacal solution of copper sulphate. This water absorbs the red or heat waves and some of the yellow, but allows the blue, violet and ultra-violet rays to pass. To the surface of the skin to be treated is attached by rubber bands a lens between the glasses of which is run a stream of water to cool the surface and keep from blistering the skin, while at the same time the weight of the glass presses out most of the blood. When the rays are turned on, they at once penetrate to the spot where the germs are feeding upon the tissue and destroy them. It is said the treatment has been very efficient in smallpox, lupus or tuberculosis of the skin, baldness in small spots, and other epidermic ailments, and the patients say there is little or no pain, and are quite ready to undergo the treatment.

Pasteur Serum.

M. Pasteur of Paris, the inventor of the Pasteur water filter, and discoverer of hydrophobia serum, has recently been giving his attention to other methods for bacteria killing. In Portugal recently the plague broke out in a most frightful manner, and daily took off scores of victims. At Oporto all experiments with the Pasteur serum were completely successful, and in China, where the plague seemed to originate, cases have been reported where life was saved. The work, however, is extremely difficult, since the natives are very suspicious of the French and English doctors. The treatment consists of injection into the blood of serum prepared especially for its deadly effects upon the plague bacilli. When the treatment is undergone in time, it is rare that the patient is not saved.

In the Pasteur institute for rabies in Paris all the persons treated in 1898 were cured with the exception of three. For the thirteen years since the foundation of the institute to the end of 1898, 13,183 persons were treated in Paris, and out of this number only ninety-nine died.

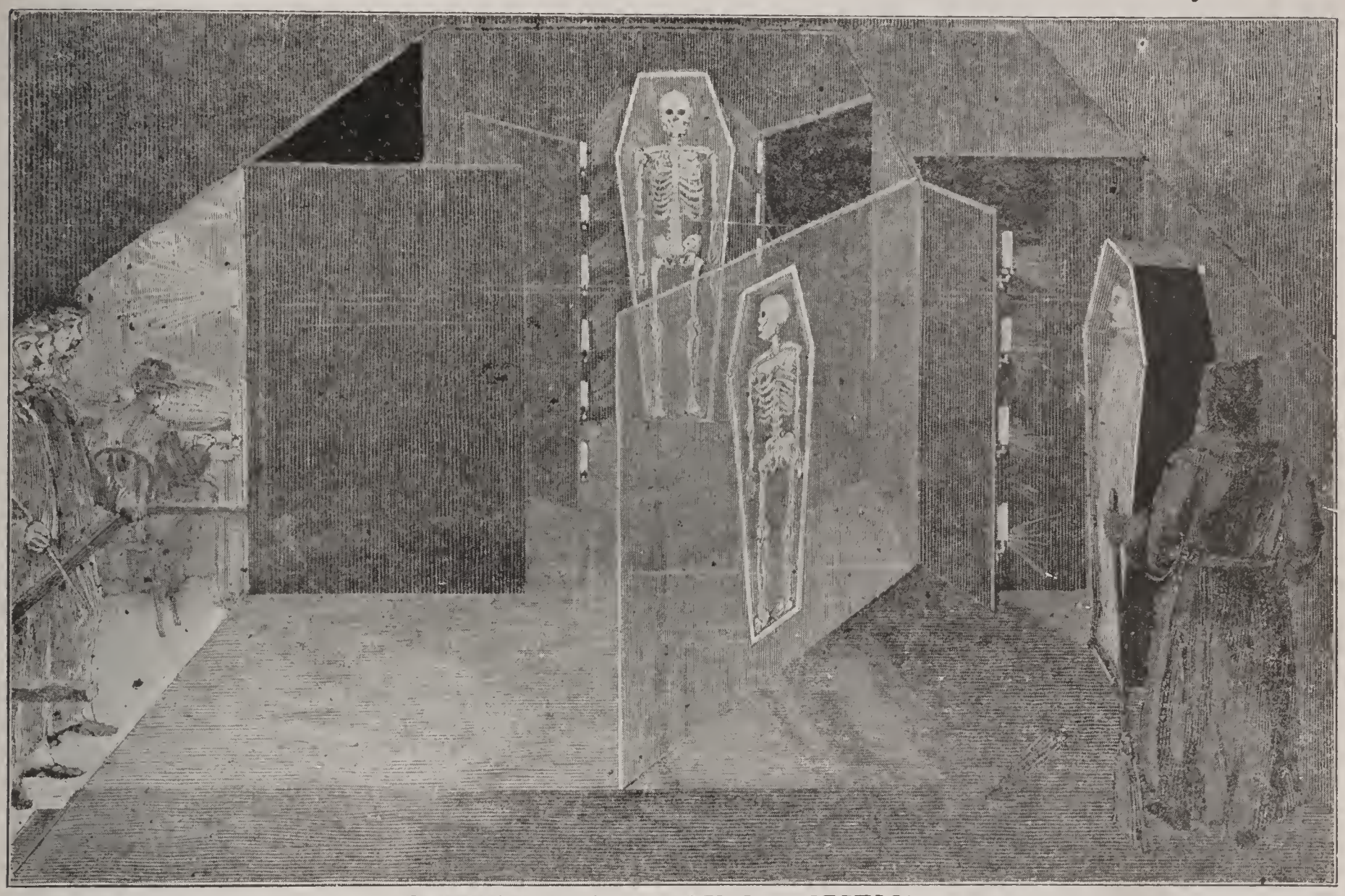
Anti-Toxin.

A serum called anti-toxin has recently been put into use as a cure for diphtheria. It is a brownish liquid prepared from the serum taken from the glands in the neck of a horse inoculated with the disease to fever point. The serum is allowed to stand and the anti-toxin comes to the surface and is skimmed off. By injecting the anti-toxin into the blood of the subject there is at once sent through the system a most deadly enemy to the diphtheria germs. One well-known physician in two years' practice with this remedy treated 2,100 cases in malignant form without losing one patient. The after effects are somewhat weakening, however, as the action of the anti-toxin tends to retard the heart's motions.

The X-Ray.

Brain specialists have hailed with joy the X-ray as a medium for learning whether clots of blood are pressing on certain parts of the brain, thereby causing insanity, or inaction of some of the facul-

ties. One well-known lawyer in a fight with burglars received a severe blow on the head which rendered him insane at times. By means of a skiagraph or X-ray picture a shadow was seen that indicated a pressure on one of the brain convolutions. A cleft was made in the skull, the pressure removed, small bone particles taken which resulted in remarkable discoveries. Other uses for these rays are constantly coming before the public Some time ago a Chicagoan suffered great agony from what seemed to be an abscess behind the base of the nose. By means of the Roentgen rays a skiagraph showed that the sufferer had in the cavity back of



A SO-CALLED X-RAY EXHIBITION.

A reflection from the man in the coffin appears on the screen at the same spot that the reflection from a skeleton in the coffin is seen at the back of illustration. By turning on one set of lights and lowering the other, the man appears to be transformed into a skeleton, and the skeleton into a man, at the will of the operator.

placed over the cleft and the skin replaced. Apparently the lawyer's reason was restored.

In stomach diseases it has been very difficult to locate enlargements or to indicate conditions of the membranes. Recently saturated chemical solutions impervious to the X-rays have been poured into the stomach, and skiagraphs his nose a small sack containing thirty-two miniature teeth. An operation was performed successfully, but for which the patient might have died. It is hinted that mental conditions are expected to be discovered by the aid of this remarkable light, certainly nearly every other malady has been treated with a measure of success. The heart can be seen beating in

one's breast, and enlargements or diseases can be promptly treated. Consumption of the lungs is discernible before it reaches its last stages, and ruptures, fractures and the presence of foreign substances can at once be noted.

Apart from medical use the X-ray was recently employed to explore the interior of a mummy casket that had never been opened since the time some old Egyptian Pharaoh had been wrapped in his burial clothes. Also mummified animals, so dried up that the family to which they belonged could not be ascertained, were easily classified after skiagraphs had been made of their bones and skulls.

Hydrophobia.

Because of the apparent cruelty of the Pasteur treatment for prevention of hydrophobia, resulting from inoculation of small animals like the rabbit with rabies in order to procure the virus necessary to inject into the patient, many scientists have been studying other methods for curing or preventing this frightful malady, with the result that the Buisson system has quite a following. Many persons imagine yet that M. Pasteur undertakes to cure hydrophobia; this is a mistake, for from the point of view of this school of scientists, the disease is incurable; the only thing they claim for their treatment is that it would prevent rabies if given soon enough after the bite. This was considered weak by many physicians, and though the Pasteur institutes have been in a wonderful degree successful, the followers of the Buisson method assert that theirs is the more simple, humane and curative system.

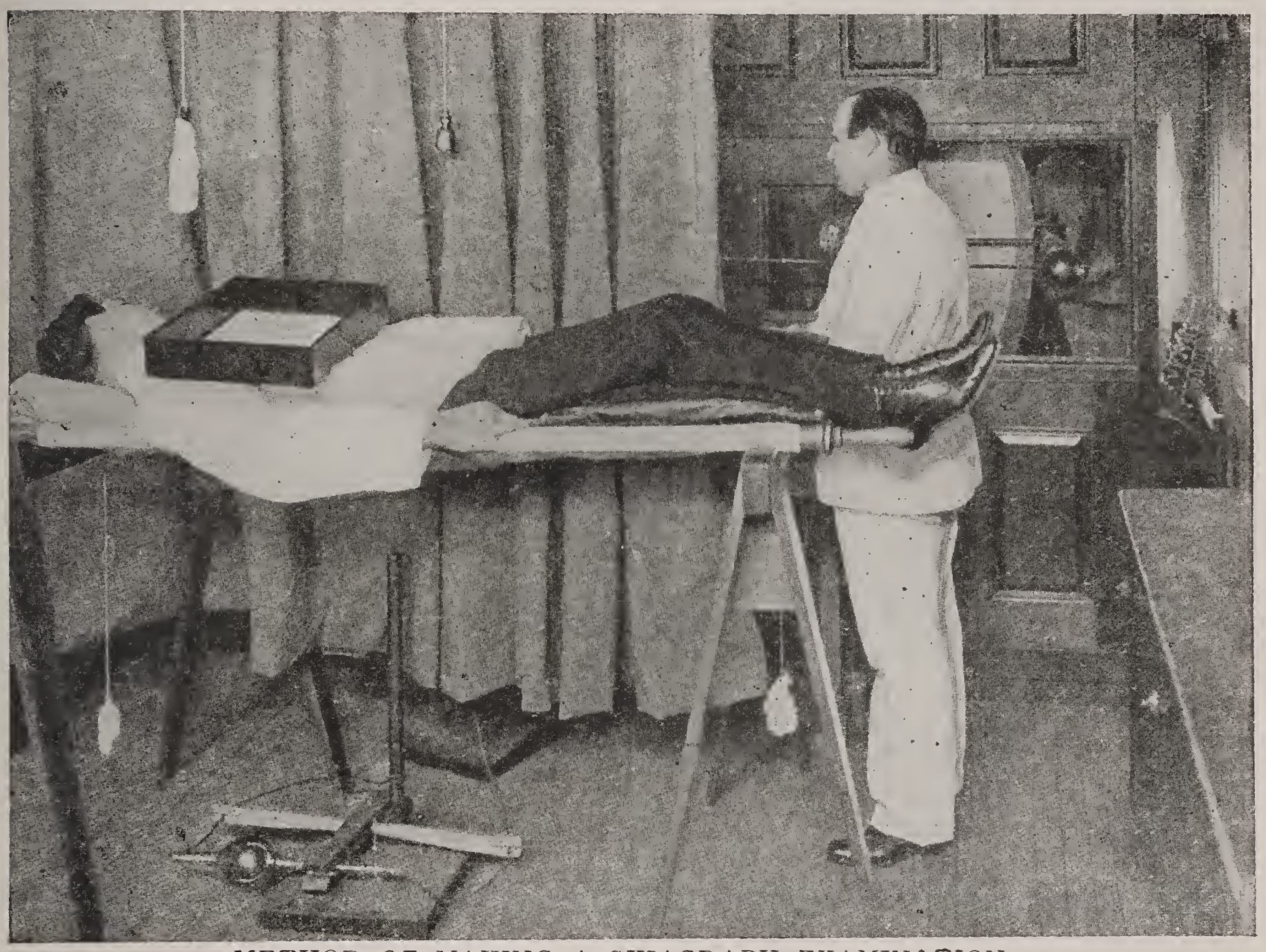
For many years the vapor and Turkish baths have been considered of great benefit in relieving many ailments. Natives of Australia, and also of India, have a successful habit of at once taking violent exercise on beginning to feel ill, upon the grounds that the sweat produced thereby will cleanse the body of impurities. It is stated that years ago the Arabs knew of sweating as a cure for hydrophobia and other poisoning. The patient was swathed in woolen covering till all but smothered, placed in a small tent of camel's hair and almost air-tight, and then left to sweat it out. This treatment has been found effective even for snake bites. The Buisson treatment is of the same nature.

A good many years ago, Dr. Buisson, a French physician, was called to attend a woman attacked by hydrophobia. In bleeding her, as was the custom at the time, he cut his finger, and incautiously wiped it upon her handkerchief covered with her saliva. He cauterized the wound when he reached home, but to no effect, for he was taken down with the rabies almost a month after. His pain was so acute and his death so certain that he sought for the easiest method to die. For some time he had considered a vapor bath preventative but not a cure for hydrophobia. He now thought of this as possibly the least painful way to die, hoping that the warm vapor might produce a languorous feeling, letting him peacefully sink off into a death slumber. Accordingly he went to a vapor bath, desired a very high temperature, and at 127 degrees Fahrenheit was cured.

He at once commenced to experiment with his discovery, with the result that he soon claimed cures for the disease even in its last stages, and prevention positively in its early forms, without the danger of the use of possibly fatal methods. Since the time of his work his followers have gone on establishing branches all over the world. Marvelous cures have been reported from every quarter and sometimes with the aid of only the crudest appli-

ances. Recently a keeper of a Turkish bath establishment in Milwaukee, Wis., learned that his dog had the rabies. In trying to coax him into a bath room, he was bitten in the hand. It has been always considered impossible to cure a dog of the rabies, but after several hours' treatment to a vapor bath, during which time the dog snapped and bit at everything in the room, he finally went to sleep and awoke cured. The keeper took a similar treatment at a high temperature and never felt any evil effects from the bite. For country use it is maintained that simply a pan of water over a lamp, with the patient sitting in the vapor and covered by heavy blankets, has effected cures.

Two theories are advanced for the curative properties of the vapor bath: one is that it opens the pores and allows the impurities to escape; the other, that the intense heat to which the body is subjected kills the poisonous germs. When medical aid cannot be summoned, life may often be saved simply by reverting to an old-time sweat.



METHOD OF MAKING A SKIAGRAPH EXAMINATION.

In the box on the patient's chest is a sensitive photographic plate. Below, on the floor, is the tube which develops the X-ray. The light passes through the patient's body and prints a shadow on the plate.

Appendicitis.

Operations for appendicitis, or inflammation of the vermiform appendix, have in

recent days been brought down nearly to perfection. In the old days of crude surgery, when one had peritonitis (intense inflammation of the bowels) he generally died, for this was not considered a case for surgery. But to-day, on the least sign of inflammation of the appendix, care is taken that medical aid is at once called to reduce if possible the swelling, and as a last means surgery is resorted to. The appendix is a long, narrow, worm-like tube attached to the cæcum (one of the bowels) on the right side of the abdomen near the hip. It is from three to six inches long, has a diameter about equal to that of a goose quill, and opens into the bowel by a rather imperfect valve. Inflammation of this tiny organ,—which, by the way, has no known use,—is rare in infants, and occurs in both males and females, though more commonly in the latter. It occasionally happens without the action of mechanical injury, and then it is supposed to result from the action of very small organisms, though it is due mostly from fecal concretions and foreign bodies such as grape and other fruit seeds, buttons, bits of bitten finger nails, and worms. It has also been caused by extension of catarrh of the intestines. These foreign bodies produce inflammation, which is generally attended by ulceration. If the poisonous matter is not gotten rid of, it will soon form a coating around the appendix and neighboring bowels; then the appendix is gradually eaten away, and when the abscess breaks it lets all the poisons into the abdominal cavity, which at once causes peritonitis, and frequently soon results in death. The most characteristic symptoms are pains, swelling, tenderness and rigidity of the abdominal wall on the lower right side. Experience has taught that almost without exception sudden pain in this region, with fever and tenderness, with or without a swelling (tumor), means appendicitis.

The Surgical Operation

starts with an incision from four to six inches long over the inflamed part. The deeper tissues or muscles are drawn back and held away from the opening by clamps. Occasionally an exploration needle is used to probe for the abscess before the operation, but this is generally condemned; however, after or during the operation, this needle may be used to a good advantage. As soon as the abcess is reached, the contents are washed out with a weak antiseptic solution, and search made for fecal concretions or foreign bodies. Then the bowel is drawn out, and the appendix removed, if it has not already been so perforated as to be nearly gone. After cleansing and sewing up the bowel it is replaced in the abdomen, and the incision in the wall of the latter is closed by sewing. Sometimes, when an abscess occurs, the incision must be kept open to allow impurities to pass out; in this case the stitches are made but not drawn close at first.

Skin and Bone Grafting.

Improvement along the line of skin-grafting and bone-making is going on rapidly. It is no uncommon occurrence to-day to graft over burned or diseased spots large pieces of flesh and skin, taken from the body of a healthy person. In bone-growing, animal bone has practically supplanted the insertion of foreign substances, such as plates of silver and the like. Decalcified bone chips (that is, bone with the lime taken out) are prepared from the fresh tibia or femur of an ox by being kept in a weak solution of hydrochloric acid for about a week. The periosteum, or outer skin of the bone, and the medullary tissue (marrow) are

removed and the flimsy bone is cut into long strips about one-eighth of an inch wide. These, when they are to be used, may be cut into smaller pieces, and laid in the cavity of the patient left by the old bone being taken out. The skin of the wound is replaced, and gradually the grafted bone grows into the bone of the patient and performs its new functions as well as that with which he was born. For cranial defects, larger bones must be sought out and used in the same way.

Voyaging at Bottom of the Sea

Wonderful Boats that Navigate below the Surface of the Deep.

SINCE the day when Jules Verne wrote his famous "Twenty Thousand Leagues under the Sea," there has constantly been some inventor experimenting to solve the problem of traveling by a boat submerged under the surface of the water. Verne's boat, the "Nautilus," was a marvel of imagination, but others as wonderful in their reality have appeared, which, though not perfect in all things desired, yet do operate at the bottom of the sea, float under the surface for several hours, and come up again safely. Such boats are being constantly studied by the war departments of the great powers perhaps more than by any one else, for reason of the uses to which they may be put during war. Such a submarine traveler, supplied with a number of torpedoes and with an air supply to last the crew a few hours, could send to everlasting rest a whole navy, equipped though it might be with the most modern methods for protection and attack.

France, as much as any other nation, has been interested in this subject, and the result of her studies has been several boats brought forth by the skill and inventive genius of Gustave Zédé. This clever man, in 1886, built at Toulon an experimental vessel,

The "Gymnote,"

so as to test the principles he held with a view to embodying them in a larger and more complete war vessel. This boat was not much more than a large Whitehead torpedo, made of sheet steel in the shape of a cigar, being 56.7 feet long by 5.9 feet in diameter, and with displacement of thirty tons. To this shell were attached horizontal and upright rudders, so that she might be steered straight ahead by using the usual rudder, or might be made to dive or rise by use of the horizontal rudder. Electric motors with storage batteries supplied the power for the screw propeller, and a speed of seven knots an hour submerged and of nine knots

on the surface were secured, while the batteries would run constantly for from four to five hours. Buoyancy was secured by a watertight compartment fore and aft, and sufficient compressed air was stored to supply the crew of five men when submerged. Besides these contrivances there was a heavy ballast attached to the bottom of the boat on the keel, that could be detached at a moment's notice in case of accident, thus allowing the vessel to rise. A long tube with reflecting lens and mirrors rose from the

THE "GYMNOTE" TRAVELING AT THE SURFACE.
Showing conning-tower and prismscope just in front of the captain.

boat like a mast. This could be bent at an elbow at right angle and made to turn about, so that the image of any object at any point of the horizon could be reflected to the cabin of the boat when it was submerged. Without this "prismscope" it would be almost impossible to keep track of the enemy when on a cruise under the surface.

The experiments with the "Gymnote" were so wonderfully successful that the French government at once set Zédé to work making a large one for practical use. The result was the vessel about which all the countries are talking, and which, in honor of the inventor, has been named the

"Gustave Zédé."

The length of this boat is 147 feet, diameter 10.75 feet, and displacement 260 tons. The hull follows the general lines of the former model, being cigar shaped with very snarp ends. The speed has been increased to 8½ knots an hour below and 14 knots on the surface. Ten men constitute the crew, and enough stored air is carried to last them while below In the nose of the boat is an opening for discharging an ordinary torpedo. She has already operated in deep and shallow water with remarkable success, and trips averaging between seventy and eighty miles are her average runs, thus giving her power to make a fighting dash at any enemy within a radius of thirty-five miles, and return in safety.

Various boats having the same general principles have been made and operated with much the same success, among others the Nordenfeldt, the Peral, Goubet, and the Holland, the latter a remarkable vessel built by an American ar d used to some extent by the United States government.

Of a different sort altogether, however, is Simon Lake's invention,

The "Argonaut."

Knowing the difficulties that beset the path of the inventor who tries to keep his boat floating under the surface in equilibrium with the water, he set about to contrive one that would travel on wheels at the sea bottom. In all types of floating boats, there is great danger of misplacing the ballast and thus tipping the boat over

CHICAGO POST OFFICE

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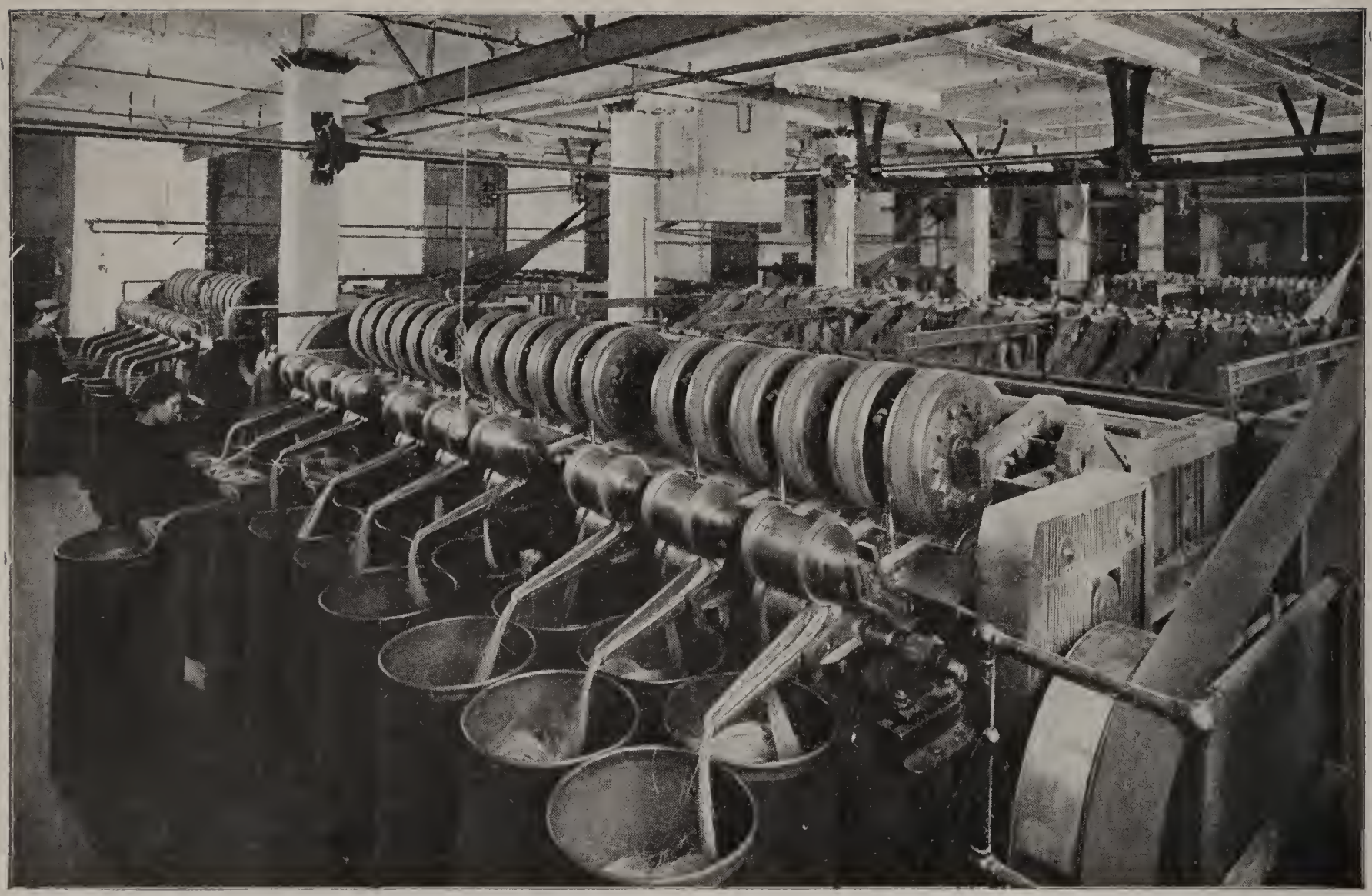
STAMPING
SPECIAL DELIVERY

A KNITTING FACTORY, SHOWING OPERATORS SEATED AT THEIR MACHINES KNITTING HOSIERY. THIS INDUSTRY HAS SPRUNG INTO EXISTANCE WITHIN THE LAST DECADE. GRANDMOTHER'S KNITTING NEEDLE IS A WEAK COMPETITOR OF SUCH AN ESTABLISHMENT

GENERAL VIEW OF CHICAGO NEAR THE MOUTH OF THE CHICAGO RIVER

TO THE RIGHT IS THE LAKE, AND NEAR THE CENTRE IS THE RIVER, SHOWING THE GRAIN ELEVATORS AND RAILROAD FREIGHT TERMINALS OR YARDS
MORE FREIGHT IS DISPATCHED FROM THIS POINT THAN IN ANY OTHER SIMILAR AREA IN THE WORLD



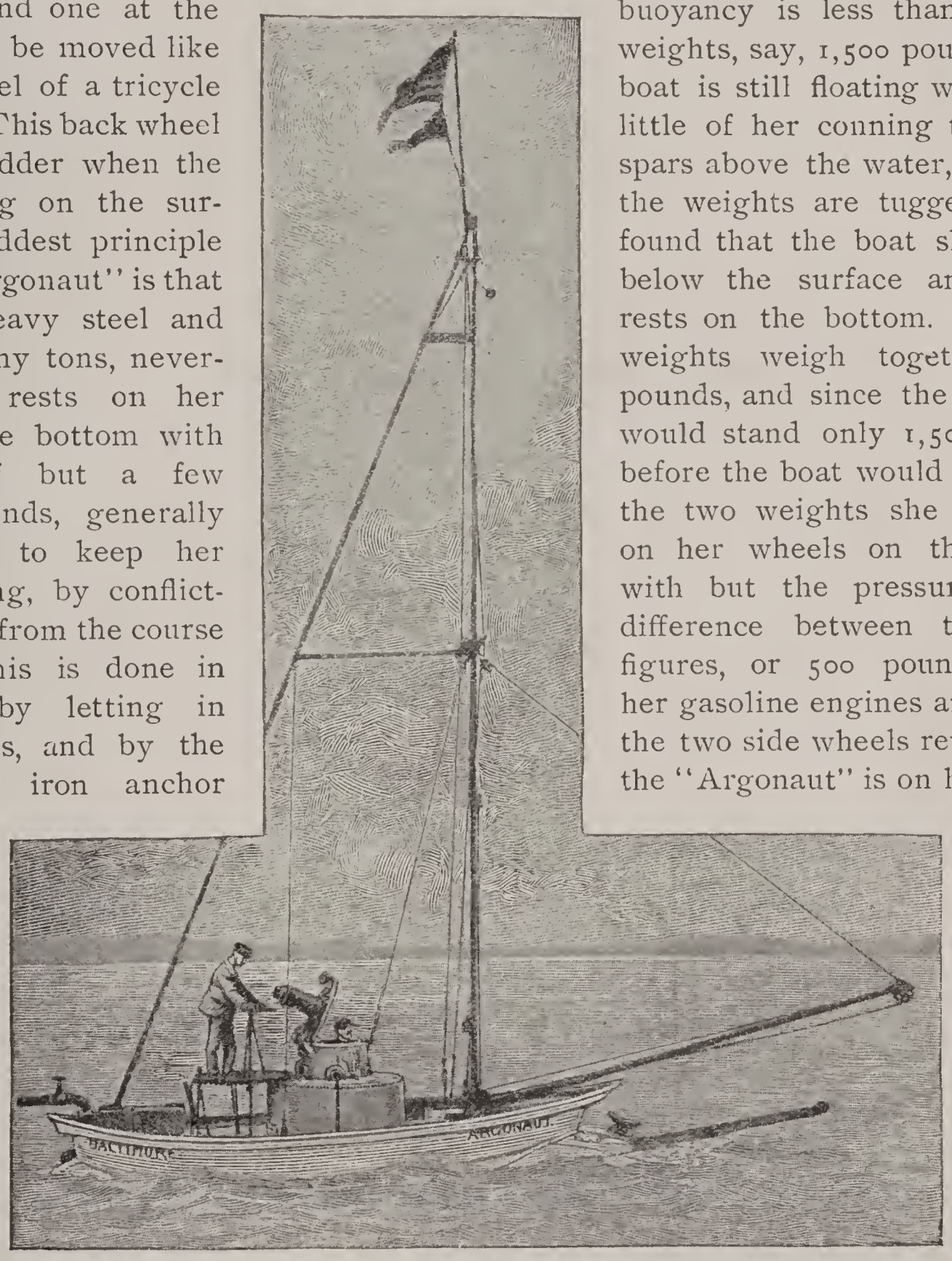
MANUFACTURING TWINE OUT OF SISAL, OR HEMP

A STOREROOM OF SISAL, SISAL GRASS IS OTHERWISE KNOWN AS HEMP, AND IS USED IN THE MANUFACTURING OF TWINES AND ROPES

on her side. This was what Lake figured against, and accordingly he brought out a boat that would float on the surface propelled by a screw, yet when closed and loaded with its water ballast, would sink to the bottom and advance along the unknown highways by means of large wheels, after the style of a locomotive. There are three of these wheels, one at either side, and one at the back that can be moved like the front wheel of a tricycle for steering. This back wheel is also the rudder when the boat is sailing on the surface. The oddest principle about the "Argonaut" is that though of heavy steel and weighing many tons, nevertheless, she rests on her wheels at the bottom with a weight of but a few hundred pounds, generally just enough to keep her from deviating, by conflicting currents, from the course laid out. This is done in two ways: by letting in water ballasts, and by the use of two iron anchor weights weighing 1,000 pounds each. When it is necessary to go

Below the Surface,

the hatches are closed tight, the two weights, which are attached by cables to a windlass, are released and at once fall to the bottom. Then the water is let into the ballast compartments till the buoyancy is less than the two weights, say, 1,500 pounds. The boat is still floating with just a little of her conning tower and spars above the water, but when the weights are tugged at, it is found that the boat slowly falls below the surface and at last rests on the bottom. The two weights weigh together 2,000 pounds, and since the buoyancy would stand only 1,500 pounds before the boat would sink, with the two weights she now rests on her wheels on the bottom with but the pressure of the difference between these two figures, or 500 pounds. Now her gasoline engines are started, the two side wheels revolve, and the "Argonaut" is on her voyage

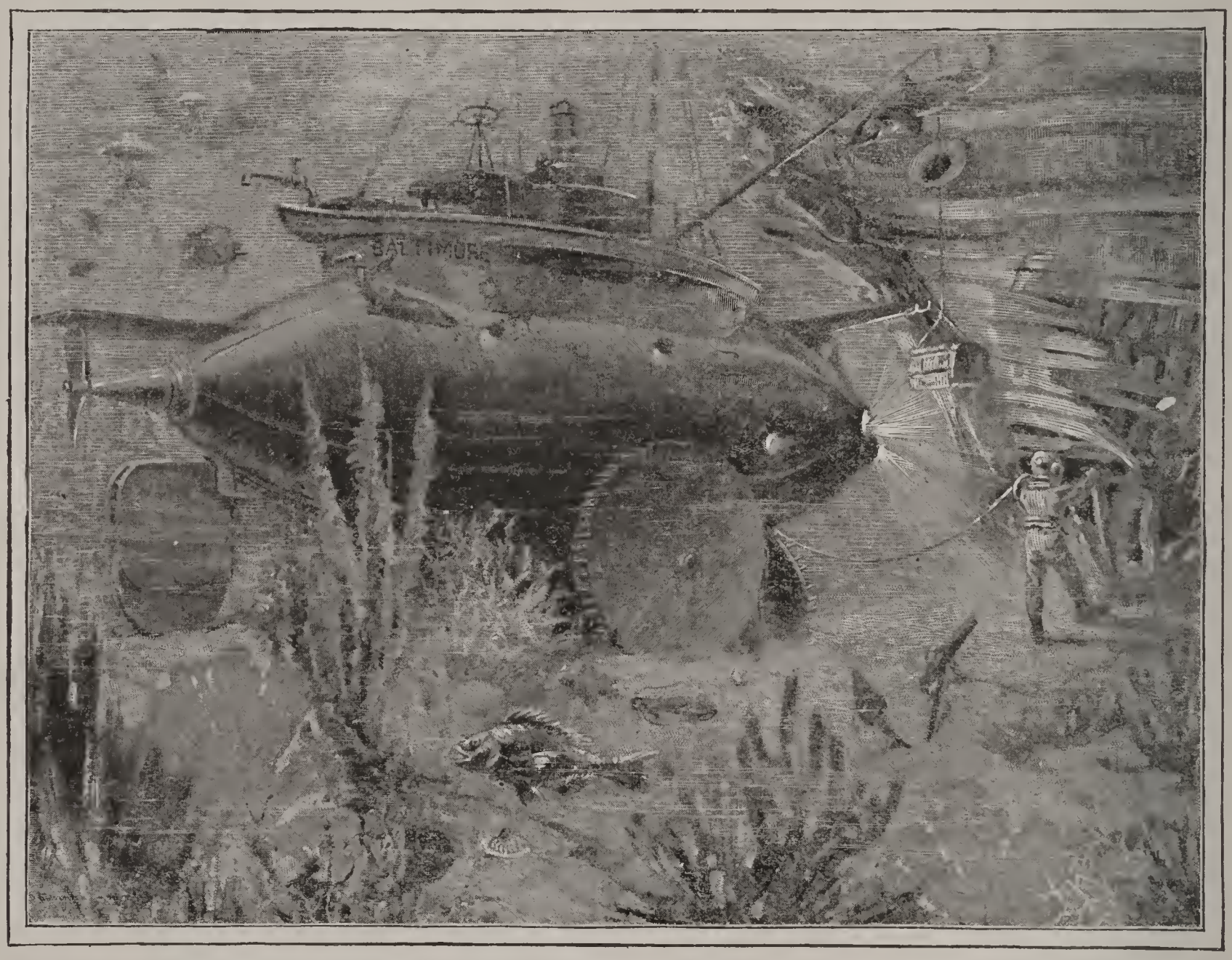


THE "ARGONAUT" FLOATING AT THE SURFACE.

Near the center is seen the open conning-tower with a man's head appearing. From this tower the boat is operated when below the surface. The man behind is steering by means of the submerged third wheel of the boat. Down one of the tall, hollow, steel masts, when nearly submerged, comes the supply of fresh air, and out at the other goes the exhaust steam.

among the queer sea monsters, aged wrecks and untold treasures.

The vessel is thirty-six feet long, cigar-shaped, with blunt nose and pointed stern, and is fitted with a thirty-horse power gasoline engine which operates the screw propeller, driving wheels, the electric dynamo, the air compressor, and derricks for hoisting the weights. Like many other submarine boats, she is supplied with air when all but below the surface, by a steel tube reaching up in the air in the shape of a mast. Down this comes a fresh supply of air, and out at another similar one goes the exhaust steam from the engine. In her nose is a searchlight that shoots out rays far ahead into the water; on her bottom is a heavy false keel that may be released in case of accident allowing her to rise because of added buoyancy. The vessel is guided by a compass, and it is found that this is entirely practicable below as well as above water, only it must be kept high above the machinery, which would otherwise affect her needle. Compressed air is resorted to for breathing supply when the boat is so far below the surface that the engine has to be stopped and the masts are entirely submerged. Then the elec-



A WEIRD SUBMARINE VOYAGE OF THE "ARGONAUT."

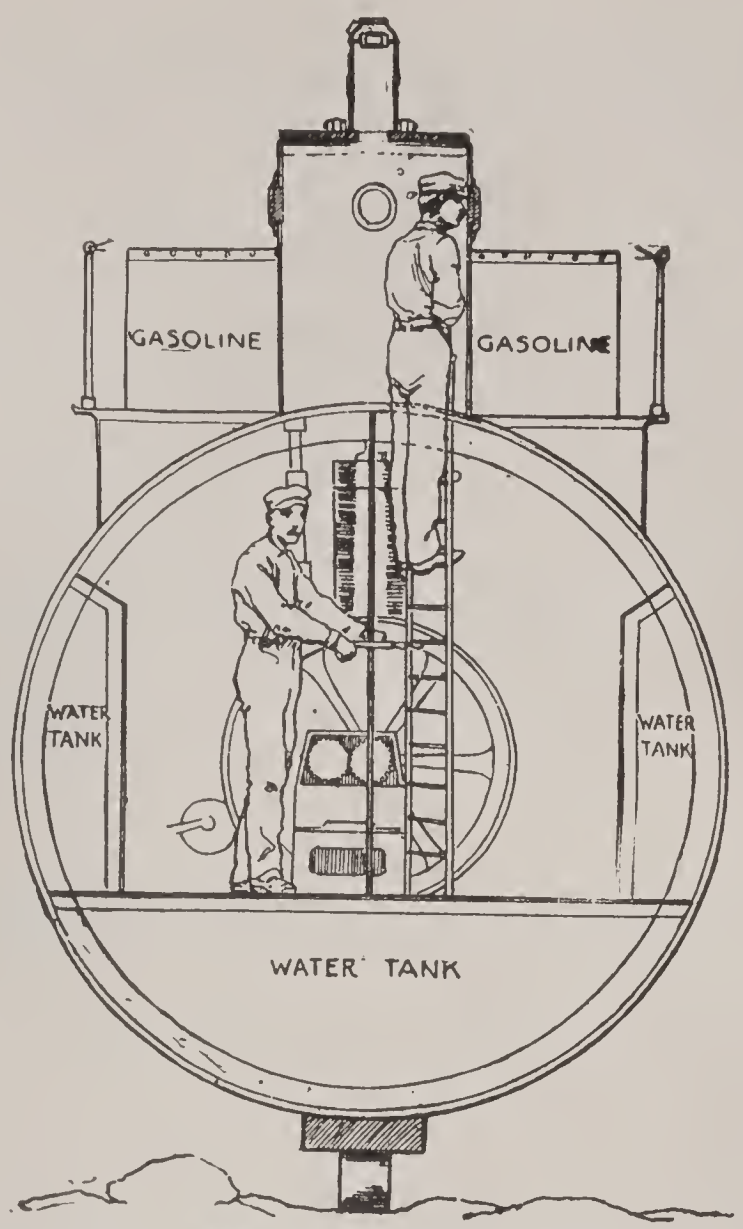
At the prow of the boat is seen a diver at work on a sunken vessel. He has just emerged from the open trap-door, and, with the aid of the powerful electric search-light in the nose of the vessel, is about to explore the unknown interior of a long-lost treasure-ship. About him, in all their glory, thrive the marvelous exotic plants of the deep sea, while, attracted and dazed by the fierce lights of the vessel, swarm the man-hunting shark and other queer ocean fauna.

tricity, stored up by the dynamo while the engine was working, is used to operate the machinery. Trips of 1,000 miles have been made in the "Argonaut" without landing, a great part of which was spent below. Air supply sufficient for five men for twenty-four hours is easily stored, and with occasionally running up near enough to the surface to let the steel tubes send down more air, these trips can last as long as gasoline and food hold out.

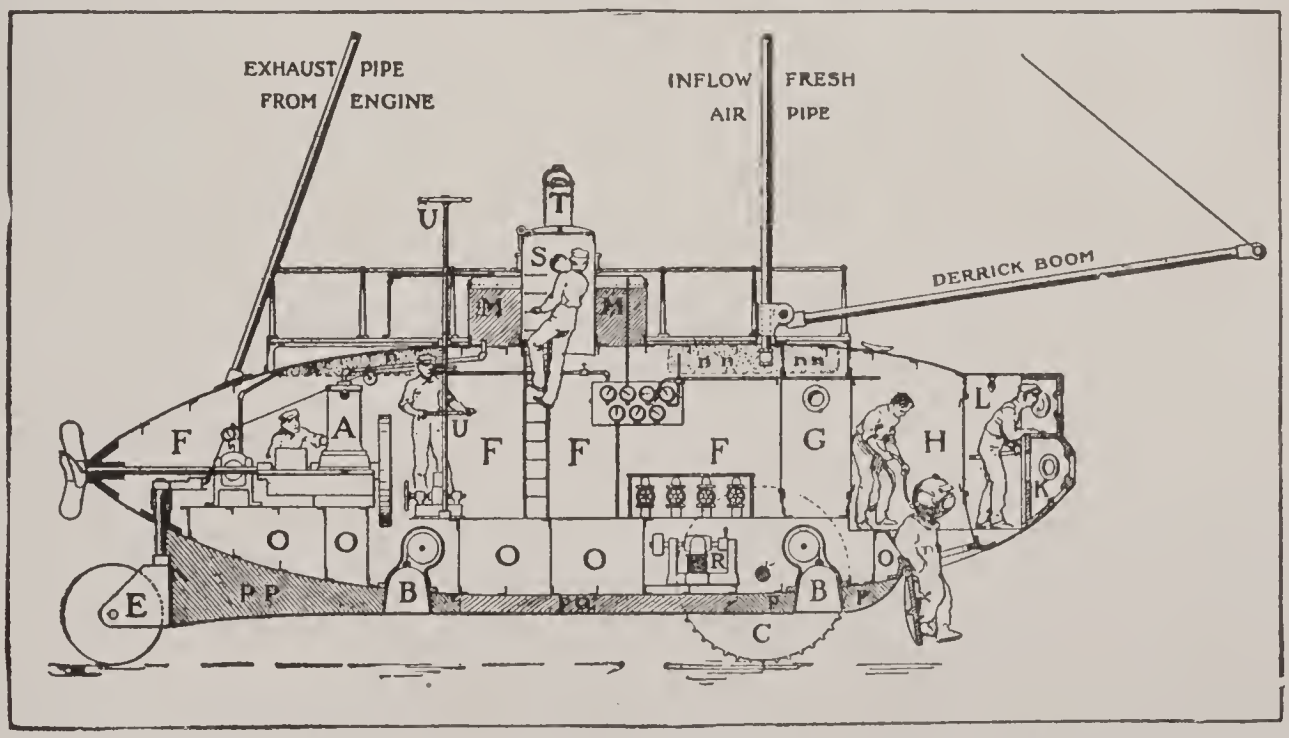
But simply to go below the surface and not be able to leave the boat would be of little avail. The "Argonaut" is therefore fitted with

Diving Apparatus,

so that men may leave the boat at any time, explore a wreck fasten a torpedo to an enemy's war ship, pick up a cable and cut it, or go a-fishing after sharks. This is all done by means of a hole in the bottom of the boat near the forward end. When a diver wishes to leave the boat, he puts on a diving suit and goes into the diving compartment, which has a great heavy door with rubber packing. This



Sectional view of "Argonaut" submerged, showing man in conning-tower making observations; also man steering with third wheel, which rests on the ocean bottom. Water tanks are filled when descending, and pumped dry when ready to come up.



A, gasoline engine, 30-horse power, which supplies all the power in moving and operating boat. BB, two anchor weights used in sinking boat. C, one of the two driving wheels. E, rudder and guiding wheel. FFFF, living room, in which are placed the engine and all other machinery and apparatus for operating boat. G, air lock; this affords a passage to and from diver's room without reducing air pressure. H, diver's room, whence is had free passage into the sea. K, bow compartment where searchlight is placed. L, forward lookout compartment. MM, gasoline tanks. NN, compressed-air reservoirs. OOOO, water-ballast compartments. PP, permanent keel. PQ, drop keel. R, dynamo. S, conning-tower. T, binnacle; the compass in this binnacle is in direct view of the outside steering gear, but from the conning-tower is read by reflection. U, outside steering gear. In general form the "Argonaut" is cylindrical, or cigar-shaped, with a very bluff bow, a pointed stern, and is 36 feet long.

door he closes, and cuts off the diving compartment from the living rooms and machinery. Then he turns on the compressed air till the pressure in the room is greater than that of the water that wants to come in. He then lets drop the heavy iron door to the hole in the bottom of the boat, and steps out, and not so much as a drop of water enters the vessel. Or suppose in time of war the telegraph cables of the enemy are to be cut. Instead of putting on a diving suit, the man to do the work simply goes into the diving room, turns on the air pressure, lets the trap door drop, and by means of a short wooden stick with a hook in the end reaches down and picks up the cable and cuts it.

The possibilities of such a boat are very great, both in time of peace and war. In salvaging wrecked ships and treasures a submarine boat would do marvels, as well as in pearl, sponge and coral fishing. The work of laying foundations for lighthouses, piers and breakwaters would be wonderfully facilitated, as well as in landing armies during a blockade, and blowing up war ships.

UNIVERSAL DISARMAMENT.

THE PEACE CONFERENCE OF THE CZAR.

AUGUST 24, 1898, by order of Nicholas, the emperor of Russia, Count Muravieff, the Russian minister of foreign affairs, handed to all the foreign diplomats at St. Petersburg a note calling for a meeting the next year of all the countries interested to discuss the question of decreasing the armed forces of the world, with a view to an universal peace sometime in the near future. It held that recent expansion of the governments and armed forces of the world were to be deplored, both from a humanitarian and an economic point of view, and that the czar held it his duty to help ward off the calamities that must soon threaten the whole world. After a session of some six weeks at The Hague, capital of the Netherlands, on July 24, 1899, the final acts of the conference thus called together were embodied in a final act. This act held that there should be a permanent

Court of Arbitration

for the pacific settlement of all international disputes; that asphyxiating and deleterious gases should not be used in projectiles from balloons in war; that dum-dum bullets, or those made of soft material that will easily expand in the human body, should be prohibited in war; and that it was desirable that all countries limit their great military forces which so burden their own people and threaten the world. It also held that it was the right and duty of neutrals to offer their services toward the peaceable settlement of difficulties between other nations; and that all private property on land should be inviolable in war, and that in naval war towns and villages should not be bombarded.

Our New Possessions.

THE UNITED STATES AT THE EQUATOR AND EXTENDING NEARLY HALF-WAY AROUND THE GLOBE.

New territory to the extent of 170,000 square miles, with populations numbering over ten millions, now under the protecting folds of the American flag.

THE Philippine Islands lie just east of Cochin China, being separated from it by the China Sea, and are between the fourth and twentieth degrees north latitude, and 116 and 126 east longitude. There are thought to be about 2,000 islands in the group, though this is not certain. A recent writer says: "The number of islands which form the Philippine archipelago will astonish many readers. It is said to approach 2,000. There are among them two which are larger than Ireland, namely, Luzon, with 42,000, and Mindanao, with 38,000 square miles. There are other islands with 5,500, 5,000, 4,500, 4,000, 3,500, and 3,000 square miles." Of the whole number some 600 are inhabited. The estimates of the population vary from 6,000,000 to 9,000,000, the fair estimate being about 7,500,000. Nearly half this number inhabit the principal island of Luzon, on which is the capital, Manila, and where nearly all the fighting of the Filipino war has taken place.

As many races almost as islands people this odd archipelago. Most important are the

Tagals of Luzon,

who number about 2,000,000 souls, and who are leading in the rebellion against the United States government, headed by their chief, Aguinaldo. They are a short, copper-colored people of the Malay race, and of exceptional cleverness. Next to them in point of intelligence are the Vicols, or Bicols, who occupy the Camarines peninsula and the islands of Catanduanes, Burias, Ticao, and half of Masbate. They resemble the Tagals, and number about 400,000. The third division of the people are the Visayas, or Bisayas, who occupy the islands between Luzon and Mindanao, and are estimated at 2,500,000. Besides these are the Moros of Sulu, the Negritos and some others of the Malay race. Little is needed or desired by these natives. The soil of the islands is rich, and the rivers teem with fish; so that with a fighting cock, which every Filipino dearly loves, and scanty attire, he leads a happy-go-lucky life.

The islands were discovered by Magellan, who landed on the island of Cebu in March, 1521, and soon after lost his life in a skirmish with the natives. In 1565 a fleet from Mexico took possession of the islands, and in 1570 a settlement was established on the Manila River, which place became the capital of the Spanish possessions in the Philippines, and continued such till the late war. Before the arrival of the Spaniards the place had

been under the dominion of the Chinese. The Dutch made an unsuccessful attempt to capture Manila in 1606, and the British succeeded in a capture in 1762. The Philippines would probably have been British to-day, had not Spain promised to ransom them for $5,000,000, which, however, remains unpaid to this day. Rebellions have been frequent in the islands ever since Spanish rule, those of 1822, 1841, 1842, 1872, 1896 and 1897 being the most important. The revolts have all had a common cause, that of freedom from Spanish tyranny. When the United States went to war with Spain, the Filipinos, under several chiefs and headed by Aguinaldo, assisted the Americans in hopes of gaining their freedom from Spain. But after the treaty of Paris, which ceded these islands to the United States pending the establishment of a government for and of the native inhabitants, the Filipinos rose in

Revolt

against seeming annexation to the United States, and since that time have conducted a sort of guerrilla warfare against the American troops. An actually established government is claimed to exist by the natives, but the capital seems to travel with the fleeing president. At present the government of these islands is that of martial law, aided to a degree with civil courts maintained by the natives, who likewise aid in the government of the municipalities.

There are

Two Seasons,

a wet and a dry; the first from June to November, the dry season from November to June. In the wet season the country is inundated, the roads are impassable, and the bridges disappear. The annual rainfall is from seventy-five to ninety-one inches. The hottest months are April and May; the droughts are then long, and the ants and mosquitoes troublesome. The coolest months are December to February. The average temperature is 80 degrees. Cyclones, typhoons and hurricanes visit the coast, and earthquakes are frequent. Many craters of extinct volcanoes are found, and some active ones are in operation. The highest mountain of the group is that of Apo on Mindanao, which is 9,000 feet high, while Halcon, in Mindoro, reaches nearly 8,900 feet, and Majon, in Luzon, exceeds 8,200 feet.

The soil of the islands is very fertile, and the products are sugar, hemp, tobacco, rice, coffee, gums, cotton, indigo, cochineal, and cocoanuts. In the forests grow rattan, bamboo, ebony, logwood and numerous other hard woods and gum-yielding trees. The celebrated Manila hemp is not made from hemp, but is the fiber of a species of banana. The Philippines are fabulously rich in gold, and copper and coal have been discovered in large veins. We had exported to these islands before the war merchandise amounting to about $100,000 yearly, and imported about $5,000,000, but since the islands are now American dependencies, this commerce has been greatly increased.

Sultan of Sulu and His Island Domain.

Mohammed Tamajamalu Kiran, Sultan of Sulu, the monarch who is now, or who will be, something of an issue in American politics, because of his recent treaty acknowledging American supremacy, is the ruler of 140 islands in the Philippines, of 120,000 subjects and a dozen wives. The sultan, his people, his wives and the 75,000 slaves in his islands are now subjects of the United States. He is known by many titles other than sultan, for example, "The Stainless One," "The Spotless One" and "The Mountain of

Light." His dress is simple, consisting of one garment, after the fashion of a modern night shirt. He is a short, fat man, with a round, boyish face and big, saucer-like eyes. Kiran lives in a small house protected by a stone wall ten feet high and quite thick. The first floor contains only one room, a large, bare apartment. The sleeping-rooms of the "palace" are on the second story. The Moros—that is the name of the sultan's subjects—have the reputation of being an innocent, harmless people, but when General Bates visited the islands on the Charleston he found that most of the inhabitants went about armed. The mother of the sultan is regarded as the most beautiful woman among her people.

THE MARIANA OR LADRONE ISLANDS.

The Mariana archipelago is a chain of islands in the Pacific stretching north and south a winding distance of about 600 miles, and embraces some seventeen islands, having an area of about 500 square miles. The islands were discovered in 1521 by Magellan, and were named in honor of Mariana of Austria, wife of Philip IV. king of Spain, though in the later days of piracy they were dubbed the "Ladrones" or "robbers," because they were supposed to be the stronghold of those pests of Asiatic waters. They are almost directly east of the Philippines, at a distance of about 1,200 miles. The principal island of the group is Guam, or Guahn, which covers nearly one-half the area of the archipelago. Formerly, when Spain first took control of the islands, the natives numbered about 120,000, but the oppressions were so great that one-half that number were killed off, and the greater part of the rest fled to the Caroline Islands. Colonization was tried from the Philippines, but these emigrants died of epidemics. In 1760 the population had been reduced to 1,600, and in 1875 but 600 survived.

The climate is very moist, several rain squalls occurring every day, which, however, the natives do not seem to mind, for it keeps the air cool. The natives grow sugar cane, rice, corn and melons. The soil is well adapted to coffee growing, but this is done only to a limited extent, while all sorts of tropical fruits abound.

Commercially the group is of little importance, for the natives need little, and no trade is done. However, the possession of Guam by the United States, which came about by the treaty of Paris, is of some political value for a coaling station, and as a near neighbor to the Philippines in case of war.

THE SAMOAN OR NAVIGATOR'S ISLANDS.

The Samoan group consists of thirteen islands, of which nine are inhabited, lying in the south Pacific Ocean, between 13 and 14 degrees of south latitude, and 169 and 173 west longitude. They are about midway on a line drawn southwest from the Sandwich Islands to New Zealand. A population of about 40,000 people, including, besides natives, Americans, Germans and English, covers the area of some 1,125 square miles. Upolu, Savaii, Tutuila and Manua are the islands of most importance. Apia, on Upolu, is the chief town, and a good seaport, while Pango-Pango, or Pago-Pago, on Tutuila, is possibly the best harbor in any of the Pacific islands, and being in direct route from San Francisco, is developing into an important port.

The climate of the islands is equable, averaging about 82 degrees, while the rain is rather evenly distributed through-

out the whole year. Tropical plants of all kinds abound, and while the commerce of the group is small, exports of cotton and the dried meat of the cocoanut are made to Hamburg and San Francisco. The natives are well developed and intelligent.

The government by chiefs was unsatisfactory, so that in 1873 they desired the protection of the United States. In 1875 a native was elected king again, but with an American for prime minister. In 1878 a treaty between the islands and the United States was effected which gave us great powers, and later on similar treaties were made with Great Britain and Germany which led to a tripartite protectorate over the islands by these two governments in conjunction with that of the United States. A chief justice appointed by the three powers to some extent controlled the courts and advised the king, while the consuls of the three countries took a prominent part in the government. From time to time jealousies arose between these three countries, and annexation to one or another of them was proposed. In 1898 and 1899 a serious difficulty was incurred because of the death of the reigning king, and American forces were landed at Apia with threats of bombardment. Trouble between the German and American officials was at last patched up, and a division of the islands among the three countries will be the result.

Tutuila,

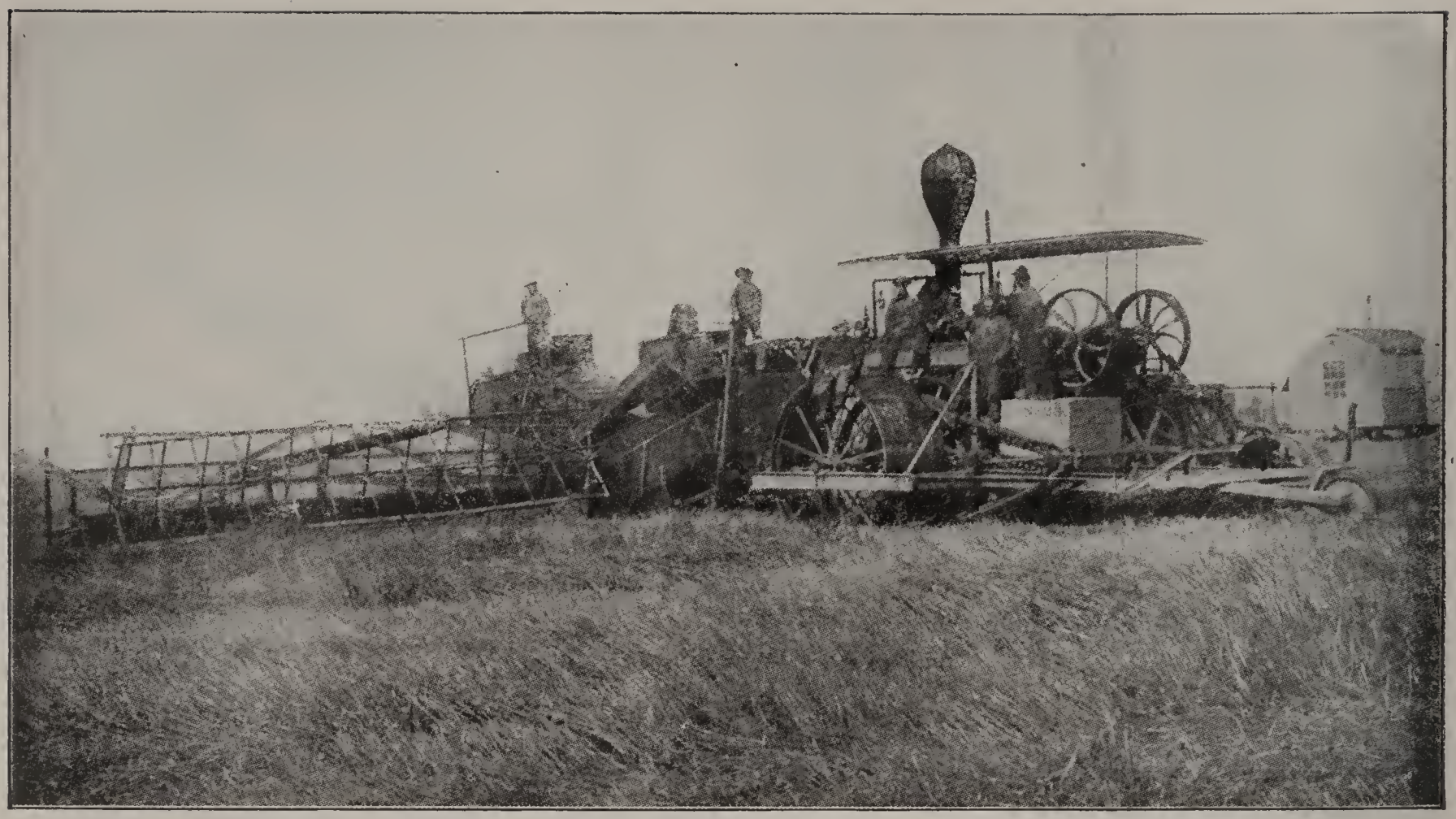
the island that will come to the United States as the issue of the Anglo-German treaty, gives us the finest harbor of the south seas, Pago-Pago. The island has an area of 55 square miles, being nearly 17 miles long and from 3 to 5 miles wide. It is well wooded and fertile, and has some rivers of fair size. The harbor has been held by the United States since 1872, and from a strategic point is very desirable, especially as a naval base of operations in the Pacific. The harbor is a natural one, and well sheltered, and may be easily fortified. It is 2,000 miles from Australia, twice that distance from the Philippines, and 5,000 nautical miles from San Francisco. With the Philippines in the possession of the United States, this new dependency is invaluable.

PORTO RICO.

The island of Porto Rico, or, according to the Spanish spelling, Puerto Rico, meaning "rich port," is fourth in size of the Greater Antilles, being exceeded by Cuba, Santo Domingo and Jamaica. It lies between the seventeenth and nineteenth parallels of north latitude, and the sixty-sixth and sixty-seventh degrees of longitude, and contains about 3,668 square miles, being about 35 miles broad and 95 miles long. The island was discovered by Columbus on his second voyage, November 16, 1493. Ponce de Leon, the celebrated explorer, was one of the first Spanish governors, and the wrongs heaped upon the natives by his arbitrary rule led to revolts. Several attacks upon the island by English and Dutch forces met with no success. The last one prior to that of our late war was by the celebrated British commander, Sir Ralph Abercromby, who laid siege to San Juan in 1797 for about two weeks. Owing to insufficient forces, he had to withdraw, and from that time until the bombardment of May 12, 1898, by Admiral Sampson, that city had had a century's respite from the enemies of Spain.

Several rebellions by the people occurred with the hope of throwing off the galling Spanish yoke and establishing a republic. One of these was in 1820, another in 1867, the latter being broken up by

SIXTIETH ANNUAL CONVENTION BANQUET OF THE CHI PSI COLLEGE FRATERNITY, HELD AT THE AUDITORIUM HOTEL, CHICAGO. THE TABLES ARE ARRANGED TO FORM THE LETTER CHI OF THE GREEK ALPHABET



HARVESTING WITH A STEAM OUTFIT

THIS REAPER IS PUSHED BY A LARGE TRACTION STEAM ENGINE, CUTS A SWATH FIFTY FEET IN WIDTH, AND IS CAPABLE OF HARVESTING 100 ACRES FER DAY. IT THRESHES THE GRAIN AND BAGS IT, READY FOR HAULING TO THE MARKET

A COMBINED HARVESTER AND THRASHER

SHOWING A MACHINE HARVESTING AND THRESHING WHEAT IN ONE OPERATION ON A 20,000 ACRE FARM IN THE NORTHWEST. THE HARVESTER CUTS THE HEADS OFF THE WHEAT AND DROPS THEM ON A MOVING CANVAS WHICH CONVEYS THEM TO THE RAPIDLY REVOLVING CYLINDER STUDDED WITH TEETH, WHICH LOOSENS THE KERNELS. THE SEPARATOR SEPARATES THE WHEAT FROM THE STRAW

GENERAL OFFICES OF SWIFT & CO., AT THE STOCKYARDS IN CHICAGO

THIS PICTURE SHOWS ONLY THE OFFICERS AND CLERKS AT THIS ONE OFFICE. IT IS THE LARGEST SINGLE OFFICE IN THE WORLD. THE BUSINESS IS SO SYSTEM-
ATIZED THAT EACH EMPLOYEE'S WORK FITS IN LIKE THE COG OF A WHEEL IN A PIECE OF MACHINERY, AND ALL RUNS SMOOTHLY GRINDING OUT
PROFITS TO THE COMPANY, AND DIRECTING THE PRODUCTION, TRANSPORTATION AND MARKETING OF MEAT FOODS FOR THE PUBLIC

MANY OF THE PICTURES OF GENERAL VIEWS IN THIS BOOK HAD TO BE MADE FROM A GREAT HEIGHTH. THIS ILLUSTRATION SHOWS THE BALLOON USED, WITH THE CAMERA AND MR. LAWRENCE, OUR PHOTOGRAPHER, READY FOR THE ASCENT

the eruption of a volcano, which so scared the people that they again gave in to Spain.

The island has a population of 815,000, of whom about 300,000 are negroes, the remainder being mostly Spanish, besides some Americans, English, Germans, and others of European nationalities. The surface of the island is broken by hills and low mountains, one range of which passes through it from east to west. The highest point of this range is El Yunque, which is about 3,700 feet above sea level. There are some 1,300 streams of remarkably pure water running into the sea, of which forty-seven are rivers of considerable size. Thus the island has abundant water supply for large herds of cattle.

The Climate

is exceptionally salubrious, mainly on account of there being ltttle stagnant water. Heavy rains occur in the north from May to September, sometimes amounting to seventy inches. In the south there is little rain at all, while over the whole island in the winter the air and sea breezes are delightful. Coffee, tobacco, and sugar cane are grown in profusion, while exceptionally fine cotton is cultivated. Besides these staples the island exports annually large quantities of cattle, hides, timber and molasses, while flax, ginger, rice, maize, citrons, lemons, oranges and other tropical fruits abound. Traces of some ores have been discovered, including gold, iron, copper and lead.

No portion of the West India Islands is lovelier or in better condition than Porto Rico. The climate draws many foreigners there for the winter ; the people are self-sustaining and hospitable, though somewhat ignorant and superstitious. Slavery was abolished in 1873, and the island is remarkably free from disorder. At first the government was temporary in nature, awaiting the decision of Congress as to the best methods of governing a race of people so diferent in all things from the average American.

When General Miles, with the

American Forces,

landed on the island in the summer of 1898, he was greeted everywhere as the benefactor of the down-trodden natives, and from town to town his victorious troops were met by the officials of the provinces, who gladly turned over the government to that of the United States. October 18, the flag of the United States was raised over San Juan, the Spanish evacuation having been completed, and January 1, 1899, the entire government, according to the Treaty of Paris, was placed in our hands.

The military administration of Porto Rico ceased on May 1, 1900, when Charles W. Allen, of Massachusetts, was installed as Governor of the island, and the civil government was instituted in conformity with the Act of Congress approved April 12, 1900. Departments and bureaus required by the new system were formed, and the administration of the affairs of the island has proved to be a complete success.

On May 21st, 1901, the United States Supreme Court decided that duties on imports from Porto Rico collected prior to the passage of the Porto Rican Tariff Act must be refunded, but that the Act itself is constitutional. On July 25th President McKinley proclaimed free trade between Porto Rico and the United States.

On September 16, 1901, William H. Hunt, who had held the position of Secretary of Porto Rico, was inaugurated Governor of the island in place of Charles H. Allen, who resigned the office.

The Modern Newspaper.

A GLIMPSE OF THE WORKINGS OF THE GREATEST AGENT OF MODERN CIVILIZATION AND EDUCATION—HOW A DAILY PAPER IS WRITTEN, PRINTED AND CIRCULATED.

Including Descriptions of Photo-Engraving, Stereotyping, and Printing by Monster Presses.

TIME was when the owner of a newspaper was editor, reporter, typesetter, "devil," presshand, and circulator, while besides the duties incumbent on these positions he had to see to the odds and ends belonging to no one in particular. But the day of the old Franklin hand press, and of setting up his articles in type before his case as the inspiration came to him, has passed, and now, with the division of labor, and the marvels of machinery, it is possible for the subscriber a hundred miles away to read in comfort at his breakfast table the metropolitan daily paper at the same time that other subscribers are reading it in the city where it is printed. To the persons who go to bed at nine o'clock and rise at five it is amazing that thousands of men and women are working while they sleep, and the sight of a large newspaper plant in full swing of operation would be still more wonderful.

Every well organized paper is divided into a number of departments, just like a government, with a head or ruler over each. In most papers there are three main departments: Business, Editorial, and Mechanical, and each of these has numerous subdivisions.

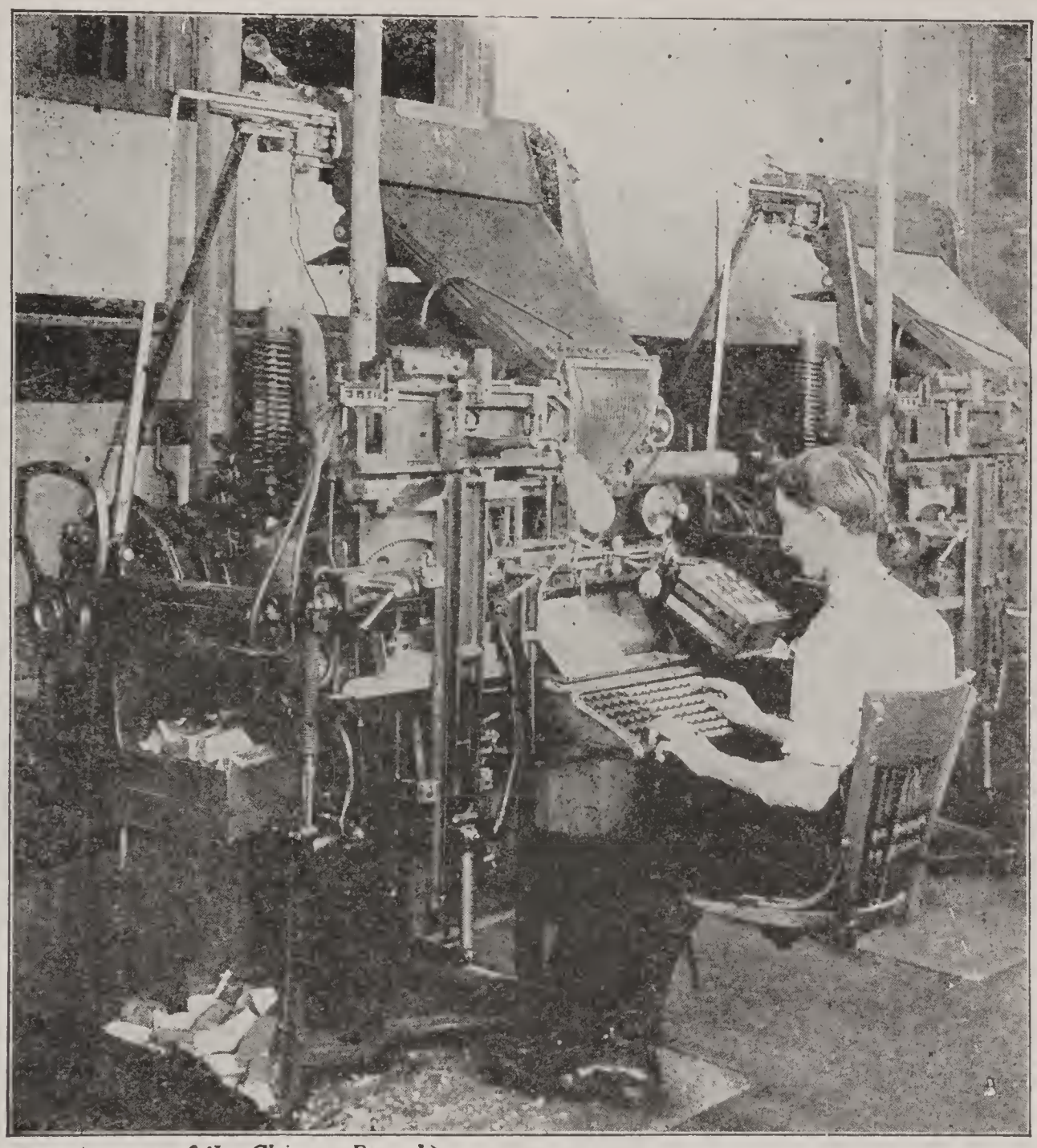
Upon the business departments devolve the duties of managing the capital invested, paying the salaries, etc., and the two greatest of all duties upon any paper that is expected to make money: the getting of advertisements, and the circulation of the paper to the subscribers. The editorial department has control of the reading matter and its preparation, while to the mechanical departments are left the duties of setting the stories, editorials and advertisements into type, the molding of the stereotype impressions of this type into great half-cylinders that are to be placed upon the monster presses, and the work of bringing forth from these presses the folded paper ready for its reader, at the astonishing rate of from thirty to fifty thousand copies per hour.

The Editorial Staff

of a paper is divided into several parts: the managing editor is head over every one in his department, and to some extent is consulted in other things than those pertaining to his own department; the city editor is directly under the managing editor, and controls a staff of reporters whose duties are to gather up the news about town and present it in readable and interesting form. Besides these two editors

and the staff of reporters, there are a number of men who write editorial comments on the great events of passing interest to the public; on them to a marked degree falls the lot of shaping a community's opinion on political or public questions. Then there are the special writers who write dramatic criticisms, sporting news, literary, art and musical notes and criticism, and last, but not least, on the up-to-date paper, the funny story man. Contrary to general opinion, the reporter does not go aimlessly about town looking for news. The modern city editor almost knows the news before it happens, and therefore has men suitable for the occasion on the spot waiting for it.

At 12:30 p. m. the reporters of a morning paper congregate in the "local" room and wait for the summons of their chief. For weeks ahead every event of importance is pigeon-holed, every article in any paper noting an incident of interest is cut out and kept on a spindle with the date marked when it is likely to be available. Then there is a whistle at the speaking



Courtesy of the Chicago Record.)

A LINOTYPE MACHINE AND OPERATOR.

The operator is at work setting "rush" copy. At the top of the machine is the fan-shaped magazine which holds the matrices of the letters. At the left, in the box and on the floor, are seen blocks of metal to be melted and used in casting the "line o' type," while at the left, near the top, is the large arm that reaches down and picks up the matrices for distribution after the line has been cast in metal.

tube in the local room; a man jumps to answer it; the city editor is calling for "Brown" or "Jones." That man hies himself to his superior's office, and here is given a definite "assignment" or job to go to this or that place and find out a particular thing. Sometimes some well-known man is in town; then he is told to "get a story out of him." There is no such word as fail when the city editor tells a man to do thus or so; failure means forfeiture of his position, and even though the city editor has been a reporter once himself and knows how impossible are some of the tasks set, yet he is never-relenting, and no excuses go.

When the man comes back from his assignment, he reports to his chief and is told to write so many words, to "play it up strong," or to "make it funny." After this is done, the reporter waits about the office for another assignment or the good news that he may go home. His "copy" or manuscript is sent up to the printer, and after being set in type is "proved" and copies of the proof come down to men experienced in correcting according to the particular style of the paper. Some phrases are never used on one paper that are of habitual occurrence on others. These "desk men" must see that all copy conforms to the paper's "style," and that nothing libelous is printed. After the proof is corrected, it goes back to the printer, who makes the correction in type, and then the article, or "story," as the reporters call it, is ready for its trip down to the stereotypers.

Photo-Engraving.

But possibly the story is of sufficient importance to need illustrating. No newspaper is complete without a corps of artists and a photo-engraving plant. Suppose the story is that of a great fire. At once the city editor on hearing the tap of the fire alarm in his office calls for reporters and artists to write up and illustrate the fire. The reporters get the news, while the artists with paper and pencil sketch the most interesting sights at the fire. This must be done in lightning-like hurry, for time is a great factor in newspaper work. On coming back to his office, the artist redraws in India ink the crude sketch he has made. This sketch is generally several times larger than it will appear in the paper, for the process of engraving reduces the size somewhat.

Zinc Etching

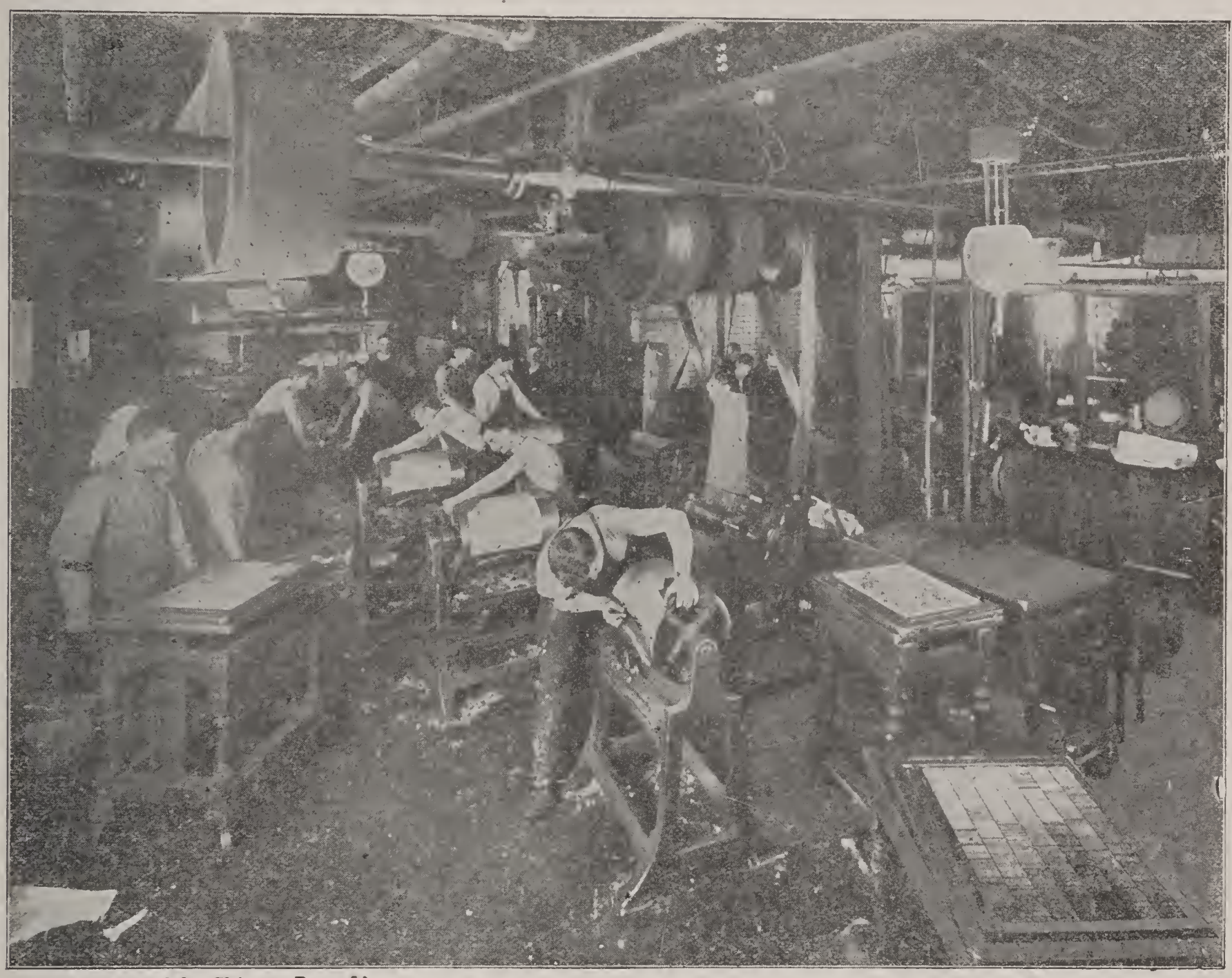
is the process generally employed in engraving illustrations for newspapers, because of the rapidity with which cuts made by this method may be turned out. The first operation after the picture has been drawn in black and white by the artist is to photograph it by means of a great camera on a "wet" plate. The camera and rack to which is fastened the picture when being photographed are both placed on a long board and hung by ropes or chains from the ceiling, a good deal after the manner of a painter's horizontal ladder hung by ropes from the roof of a house. This is done so that they will hold the same relative positions to each other, and if there is any jarring it will not affect the exposure. The exposures are generally made by the light of an electric arc lamp placed just back and to one side of the lens of the camera.

After a number of plates have thus been exposed, they are developed by ordinary photographic silver process. The use of "wet" plates is most important, for by this process the gelatine film which is wet may be stripped off from the lighter

glass used in the camera and pasted on a heavier glass for printing, several pictures on one plate. This heavy plate glass is then dried over a gas stove till the gelatine is perfectly hard. Now a sheet of sensitized zinc is placed behind this plate, and is exposed to an electric light, that shows up the lines of the picture. After this there is a treatment of

Nitric Acid

that eats away the exposed surface of the zinc plate and leaves the inked lines standing out. The plate is then treated



(Courtesy of the Chicago Record.)

STEREOTYPING ROOM OF A LARGE DAILY NEWSPAPER.

Showing the metal plates being prepared for the printing presses.

the same as one would print an ordinary photograph. The negative, being dark except in the places where the black lines of the drawing show in white lines, admits light to the sensitive zinc only along these lines. The zinc plate is now taken to the dark-room, where it is coated with ink and treated by a developing process to a shower of red dust called "dragon's blood," which is burned into it by placing the plate on top of a hot gas stove. The plate would now be almost good enough to produce a fair impression, but acid and burning are repeated four times, once for each side of every line. Then the eaten-out portion is made still deeper

by the "routing" machine, which consists principally of a little drill-like tool, driven rapidly by electricity, which bores down and scrapes away such parts as are likely to blur in printing. After this process, the etching is ready to be mounted on a metal base and sent to the printing form.

Other methods such as half-tones and color-processes are used at times on newspapers, but for general work the above-described process is in the main adopted. The time used in preparing an illustration from the moment the artist returns to make his final drawing till the cut is placed in the form is often less than an hour.

The Linotype Machine.

One of the greatest machines ever invented is that which does away with the old method of setting type by hand, substituting instead a device that performs with mathematical precision every act necessary for typesetting except thinking. Ottomar Mergenthaler, an inventor who recently died a millionaire, brought about this revolution by inventing the "linotype" machine, which, as the name would indicate, sets automatically a "line o' type." This machine, which looks like a huge typewriter, has for its essential feature the "matrix," while the keyboard, triggers, rollers, pistons, elevators, sprocket wheels, and levers work with such accuracy that the line of "matrices" is carried down to the box for the molten metal, there is flooded by the metal, and then each separate matrix is carried back to its respective little box, waiting for the next tap on the keyboard that will call it into use again. The matrix is a mold of a particular letter made of sheet brass, and varying in thickness according to the width of that letter. If you were to press a type into some wax or putty, there would be the reverse of that letter; just so with the matrix. At the top is a V-shaped cut made up of little steps, and at the side of the matrix is the imprint of the letter to be used. Each of the little steps in the V plays an important part, for they are different in each matrix, and after the line has been molded, these steps help in the automatic sorting of the matrices back to their proper places in the magazine. The operator sits before his keyboard something like the typewriter girl; he lightly taps a certain key, and there at once drops down from the magazine and falls into place near the metal box the matrix of the particular letter wanted. The keyboard is laid out the same as the type case of the old days, the "lower case" or small letters being on white keys, the "upper case" or capitals on black, and the punctuation marks on blue keys; separate letters not much used are kept in a little rack at the side, and may be put in by hand. The "typo" taps away on his keyboard until a bell rings that tells him a line is completed. He then pushes down a lever at his right side, and the line of matrices is picked up bodily, carried to a set of clamps, splashed over with hot metal, and then carried up by an elevating arm to the distributing part at the top of the machine. Here, by means of the little step-like grooves, each matrix is sorted out to its proper compartment by a machine somewhat on the principle of a sieve.

The Distributing Bar

extends along the whole length of the magazine, which is fan-shaped and divided into tubes all ending at the bottom in the little runway where the matrices come out. Beside the bar is a long revolving screw, and as the row of matrices come up from the elevating arm this screw pushes them along the bar. In front of the compartment allotted for

each letter is a special set of notches. As was said before, each letter has a set of little steps on the V-cut; these notches and steps agree for each particular letter, so that as the matrix of the letter "A" is carried along the distributing bar it can enter no compartment but that whose notches its little steps fit—just like the key that fits only one door.

100 letters.) There are men who can set even 10,000 ems per hour. Mistakes, of course, occur as in setting by hand, and the proofreader must send the matter back to be corrected.

In setting

Large Advertisements

and headlines only is the old method of hand setting now used. This is necessi-

(Courtesy of the Chicago Record)

FOUR O'CLOCK A. M.

A crowd of newsboys waiting for their papers.

Hot Type Metal

is always kept in the metal box, heated by a gas flame. Knives trim the edges of the molded line of type to the exact size necessary. After the metal has been used once it is again melted up for more type. Typesetters can set as high as 7,000 ems, or matter to the amount of one newspaper column, in an hour, whereas it formerly took six hours. (The 'em" is the standard of type measurement; 100 ems is equal to the average

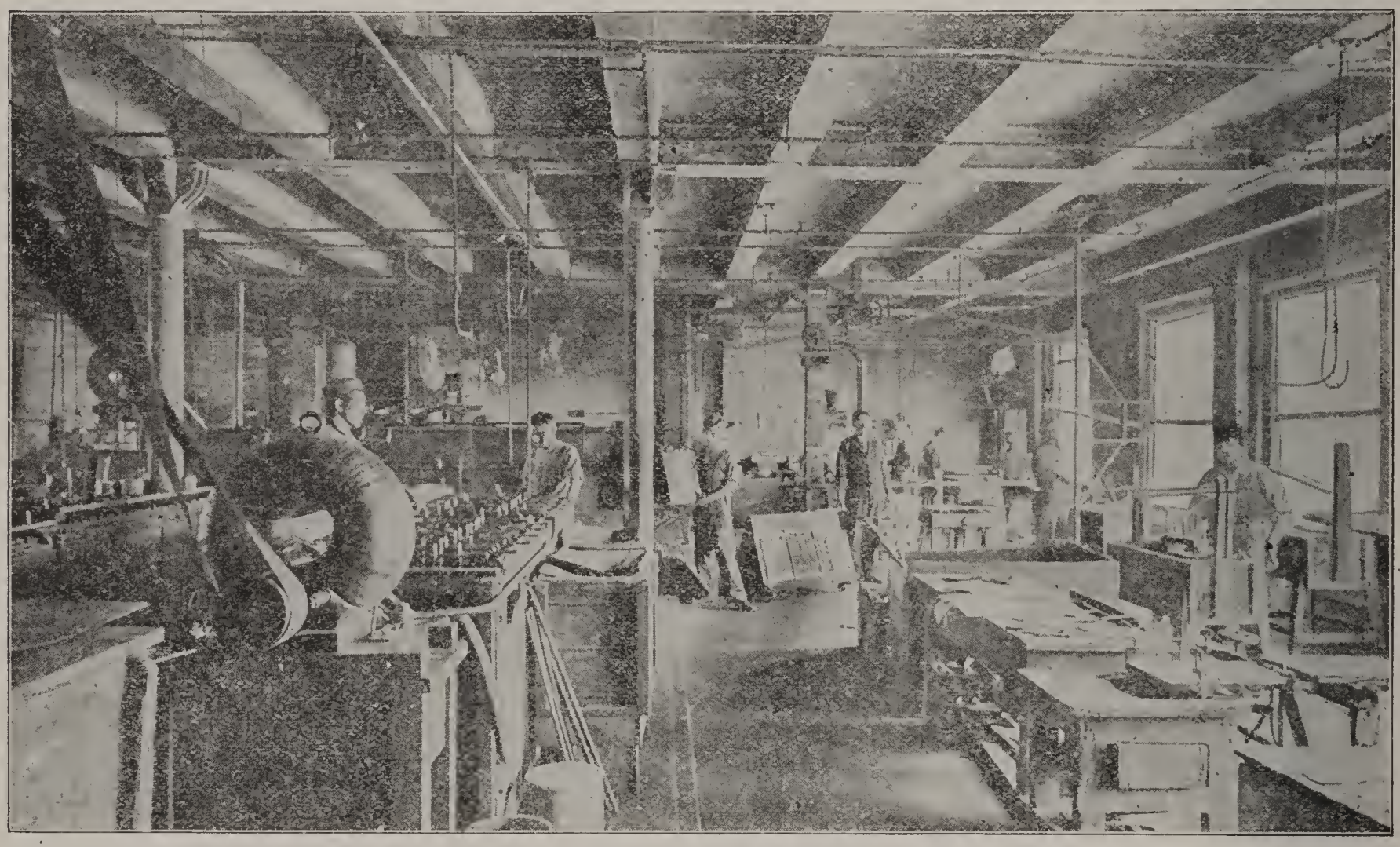
tated by the use of large and odd-sized type. And still the "ad" room of a paper is not the least interesting part of its plant. Here, on nights preceding a great "bargain day" of some of the leading stores of the city, many men, expert in style of setting up fancy advertisements, are kept busy arranging the most attractive displays of type for the reader on the morrow.

After all the advertisements and articles are set up in type, they are sent

to stone tables where men called "make-ups" see that each "ad" or story finds its proper position in large, square steel frames called "forms." In these the type is securely locked by screws so that the "form" may be sent down an elevator to the stereotyping room, where another process is gone through with before the press gets the work.

Stereotyping.

Each page is made up separately, and as the "chase" containing the type reaches the stereotyping room on the elevator it is at once placed upon the steam table to dry, for the "make-up" has used a wet sponge to dampen the type and make each line stick against the other, to facilitate in handling. From



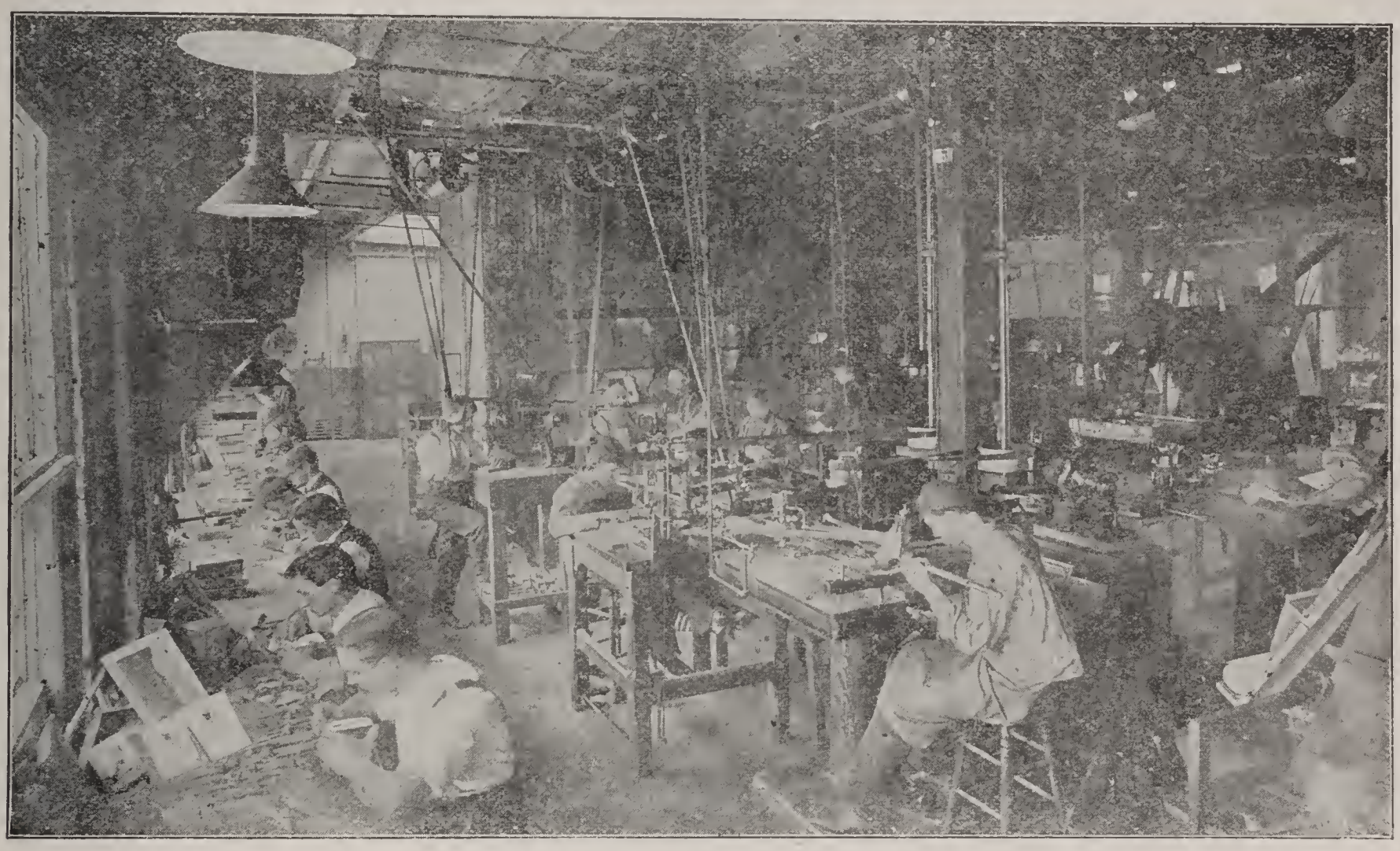
THE FOUNDRY.

To the left, the electric battery; to the right the men are making an impression of the type in wax, and after the wax receives the coating of copper in the battery they take the copper shell and pour the metal into it—this is called casting.

Time was when we printed by simply bringing a heavy weight to bear upon the flat surface of the paper spread on the inked type. That was when printing was done by hand. When the style improved and great cylinder presses came into use, type in its ordinary form would not do, but great circular molds had to be made that could be placed around the cylinders. This process is called

the steam table, after the type is dry, the chase goes to a table where a "matrix" is made, only this matrix is not in brass, but in a sort of papier-mache. Sheets of tissue paper specially prepared are kept damp over night, and a sheet of this is now placed over the type. This is pressed into every little crack in the type and forms a reverse impression, which can easily be read. Then "backing" powder,

consisting of lime, flour and charcoal, is spread over the back and into the impressions, after which other paper is spread over and the whole affair is covered with heavy blankets and shoved under a heavy press heated by steam. Here it is allowed to remain until the paper has become hard and dry, when it forms a light, almost fire-proof mold that can easily be bent into the shape of a half-



ENGRAVING HALF-TONES.

To the left of the picture are the finishers; to the right are the men that rout out the portion of the plate that isn't to print.

cylinder. Then the matrix is placed in the

Casting-box,

which is semi-cylindrical in form, consisting of two parts, one of which opens. The matrix is laid on the face of the casting-box, which bends it into the shape desired; the box is closed, the metal run in, and allowed partly to cool. While still hot to the touch, men with heavy gloves seize the cast plate and trim off the rough edges, and chisel out any imperfections. After this the plate is run under water to cool, and we have ready for the press a mass of metal the size of a page of a newspaper, seven-eighths of an inch thick, and curved exactly to fit the cylinder of the press.

Monster Presses.

The Hoe press is possibly the largest and best of the monster printing machines of to-day. They are quadruple in form, and are so ingeniously arranged that they take in paper in enormous rolls on spindles on one side of the press, print the pages, paste the pages together, cut each paper off at the proper time from the rest that is being fed from the spindle, fold the papers, count them, and deliver them at the rate of 48,000 four, six, or eight page papers an hour, 24,000 ten, twelve, fourteen or sixteen page papers an hour.

or 12,000 twenty, twenty-four or thirty-two page papers an hour. Each press needs floor space 22 feet long by 12 feet wide, and stands over nine feet high. The press is really two presses in one, paper being fed in from two rolls at a time, while the folder is really a separate machine connected and operated by the press. Each press has four 14-inch plate cylinders to which are attached by screws the stereotype plates. The cylinders revolve in the opposite direction to the impression roll, which is a heavy iron cylinder that presses against the plate and is covered with cloth. After a roll of

Hundreds of Pounds of Paper

is adjusted at the back of the press the paper web is run over a roller which smooths it out. Next it is grasped by the first impression roll, and it passes over the plate, receiving its first impression. Then the web runs downward to the second impression roll, where more is printed. Carrying tapes which guide the paper then run it up over the top of the press, where it is slit by a circular knife, and two wheels apply paste to the edges of the paper. Now the web is led to the folder over an angle-bar, and the mechanism is so perfect that the pages are all brought out in their proper position and the leaves cut. The other half of the press has been working in the same manner, either to make a complete paper like the other, or a supplement that is "stuffed" into the other part.

The Greatest Care

must be taken in operating the gigantic press, both to protect its delicate parts and the hands and legs of the men in attendance. One man holds a lever that starts and stops the press, others run about with oil-cans, lubricating every part, while others see that the ink is properly fed, and that the paper does not break or that a fresh supply is on hand. The cost of a Hoe press above described is $40,000.

From the maw of this great giant the papers are run in on little electric trolley cars to

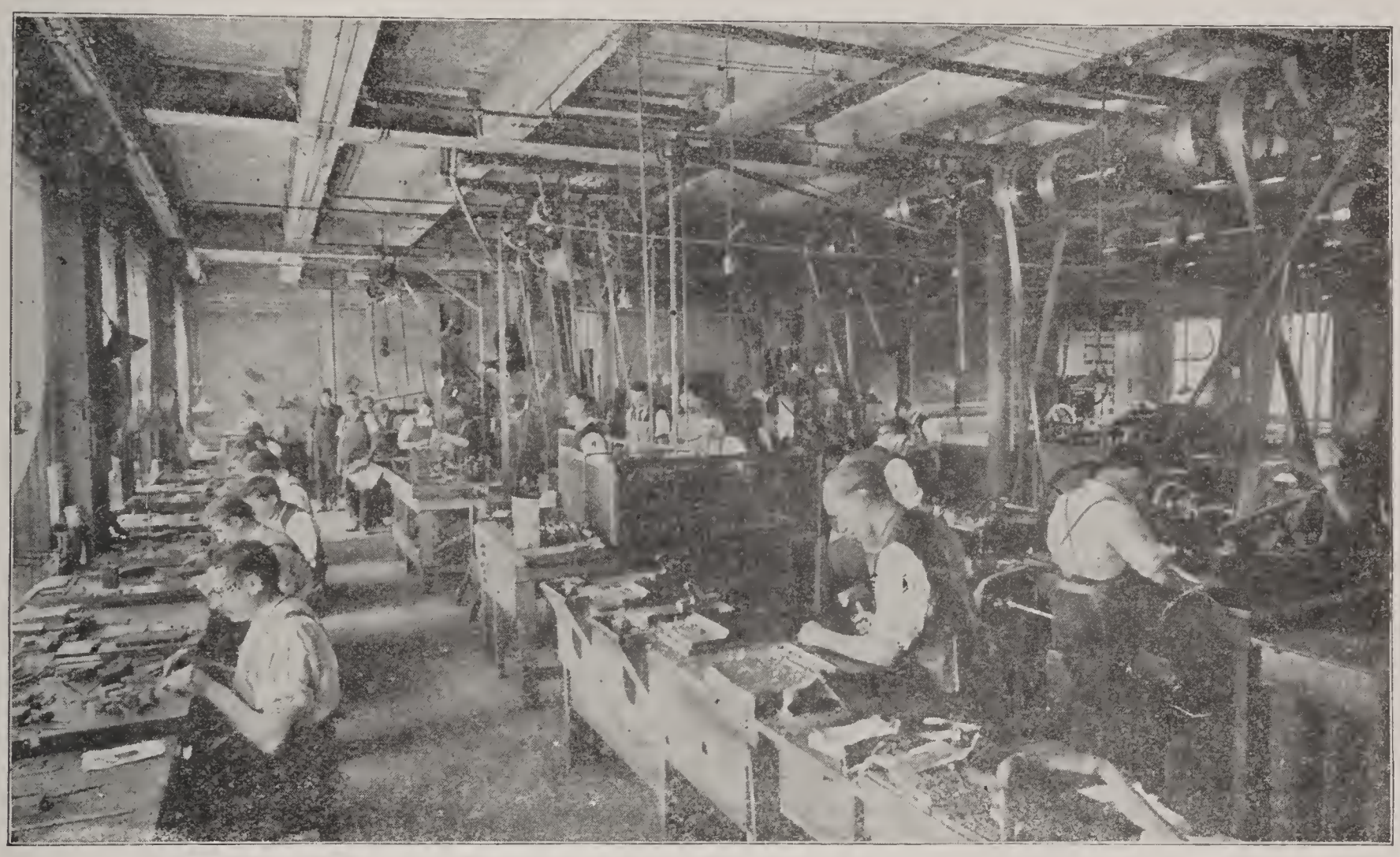
The Mailing and Delivery Rooms.

In "newsboys' alley" has congregated a crowd of urchins with their pennies ready to lay in a supply for their morning trade. Each has bought a check from a cashier which bears upon it the number of papers to which he is entitled. With this check he falls into line at the delivery window, and as his turn comes, he yells out the number. The man behind the window rapidly counts out that number, takes his check, and throws the bundle of papers at him. So quick is the whole process from writer to street boys that "hot" news brought in at half-past two in the morning is in the hands of the early riser at four o'clock. But there is yet the subscriber living at a distance who must be supplied with his particular morning favorite. As soon as his name is entered on the subscription list, this list is sent to the printer, who sets it up in type. From this is printed upon long strips of yellow paper the names of every subscriber who is to receive a paper by mail. The printing includes with each name the post-office and street address, together with date of expiration of the subscription. These strips are set into still larger strips, and sometimes pasted together, so that by a clever little device called a "mailing" machine, in the hands of skilled "mailers," each little label is carefully gummed, cut off from the strip, and with a slap is pasted on the outside of the paper, thus telling the postmasters its destination.

This process is, however, only for the single subscribers; for the dealers there have been prepared early the evening before large wrappers with their proper labels for sending, together with the number of papers to be sent, plainly marked on the outside. So when the time comes for wrapping, each mailer can rapidly count out the desired number, apply paste to a number of wrappers at once, hurriedly roll up the bundle and throw it into the sack for a particular train.

All the "galleys" of printed lists of subscribers and dealers out of town have been arranged in geographical order, that is, all those going to one town are on the same list. This greatly aids in sending out to the trains, for as soon as one strip is done, that bunch of papers is put in a bag ready for that town or train.

Business Departments of the newspaper are where all other details are thought out. Advertising must be obtained which will bring in money to support the plant and make money for its owners. Schemes must be worked out to induce customers to buy this particular paper instead of some competitor. Enormous contracts for buildings and machinery must be let; new devices developed that will increase the reputation of the paper; correspondents abroad hired and paid; press associations formed with other papers for the protection of their general interests. And when one stops to consider how vast are some of the American journals, with several issues each day, and great magazine-like editions on Sunday, with circulations that run nearly to a half million copies daily, the nature of such stupendous business enterprises may be imagined.



THE FINISHING DEPARTMENT OF AN ELECTROTYPE FOUNDRY.

Death-Dealing Machines of War

HOW THE ARMIES AND NAVIES OF THE WORLD FIGHT TO-DAY AS COMPARED WITH METHODS USED ONE HUNDRED YEARS AGO.

Huge Floating Arsenals; Shells Fired Eight Miles; Smokeless Powder; Torpedoes and Submarine Mines.

IT has been said that improvements in deadly war missiles will before long put a stop to war altogether. One would almost think so when it is considered what marvelous strides invention has taken along this line. Time was, and not long ago either, when the round cannon shot was aimed at the tough oak side of the frigate; when the grappling chain and cutlass for hand-to-hand conflicts were necessary on all war vessels, and the bayonet and cavalry charge played great parts in land battles. Most of this is now changed. The iron shot gave way to steel projectiles, as the wooden hulls were replaced with steel. The completeness of victories, however, is no less than in centuries past; distances are only greater. And each increase in the power of improved explosives and projectiles will be met with greater defensive devices, and with greater distances between the firing lines. It will be the brotherhood of man, not the deadliness and fear of weapons, that will bring about universal peace.

To-day, in land forces there are such improvements as the far-reaching rifle, with its nickel-capped bullets, the Gatling, Maxim and Hotchkiss guns, smokeless powders, and such explosives as cordite, dynamite, lyddite and nitro-glycerine. Charges play some part, as in the gallant fight of San Juan Hill, but, in the main, artillery and long-distance firing prevail. With the navy more marvelous improvements have been made. Nearly everything on board ship can now be operated by electricity. Ships are lighted, torpedoes, guns and mines fired, searchlights are operated, torpedo-boats propelled, and a hundred other devices all controlled by this weird agent.

The armor plates of the modern vessel are thick and of the hardest steel known, yet they are readily pierced by the enormous shells thrown at the distance of several miles from the throats of great dynamite and compressed air guns. Among the numerous

Explosives of High Power

that are coming into use, the newest and possibly the most powerful is lyddite. Like others of its class, such as dynamite, melinite, cordite, maxinite, etc., it is picric acid brought into a dense state of fusion. Picric is obtained by the action of nitric acid on carbolic acid. When lyddite shells explode they grind their outer coverings into small fragments, and with a noise like the downfall of the heavens, tear everything to pieces for yards around. This explosive is being used now by the English in the war with the Boers, though the latter have complained that such is against the codes of civilized warfare. General Kitchener also used it in his campaign of the Soudan with tremendous effect. A shell was dropped into a mosque at Omdurman,

where 120 Mahdists were worshiping. The mosque and its inmates were

Blown Into Pieces,

and only twelve of the worshipers escaped alive. In the war between China and Japan, cordite, a similar though inferior explosive, was thrown in a twelve-inch shell into the Japanese flagship Matsushima with the effect of hurling a 4.7-inch gun from its mounting, firing a heap of ammunition, disabling two more 4.7-inch guns, and killing and wounding ninety officers and men.

Smokeless powder is another deadly explosive, having for its main peculiarity the quality of exploding without smoke, giving off only a slight violet vapor, that is not sufficient to betray the ambush of the gun. This kind of powder is made in long cylindrical strings and then cut up into small pieces. In the United States war supply factories, it is coated with plumbago by being placed in receptacles with the powdered black lead or plumbago and shaken up. This coating, being rather oily, keeps the powder from igniting by friction in case of rough handling. Cordite looks a great deal as its name would signify, something like brown jelly pressed into long strings from one-sixteenth to one-half inch in diameter, and dried. Some kinds of smokeless powder look for all the world like carefully cut strips of slippery elm bark. It is made in slabs about one-fourth inch thick and a foot and a half to two feet long. This powder is much safer to handle than common black or brown powder, and will bear quite a blow provided no sparks are struck. Like all smokeless powder, it will burn without special danger if a match is applied to it, with a clear, steady flame, not flashing with a big s-s-s-s like the old sort. Some of these explosives are cut into pieces just like Saratoga chips, and it is a rather blood-curdling job for one not informed to watch shell-loaders hammer home this stuff into the big shells as though in truth it were only so much potato.

Nitro-Glycerine,

which is used in some of its forms for war purposes, but more especially for blasting oil-wells and the like, is one of the most difficult of all explosives to manufacture. It is generally pale yellow in color, is odorless, and has a sweet, pungent taste, though when touched to the skin will cause severe headache. It is made in a large tank called an agitator, which has a set of revolving paddles. Into this are poured equal quantities of nitric and sulphuric acids, and after a mixture of 250 pounds is secured, sweet glycerine to the amount of 1,500 pounds is added. The chemicals naturally tend to come to great heat, but since ninety degrees explodes the mixture, water pipes are arranged about the vat to keep down the temperature. In carrying this explosive there is great danger of jarring. Makers of the stuff generally live only about five years at their work. As in all other factories of powders and the like, no metals are allowed, and the shoes and clothing of the workmen must be changed to suit their employment. Canvas shoes are used, and the men may not turn their trousers at the bottom for fear of bringing in grit and gravel that might strike a spark

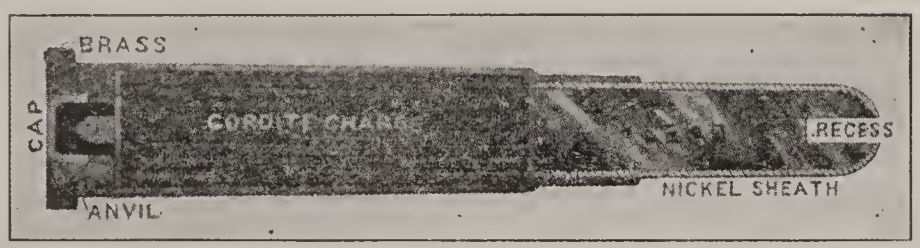
Projectiles

have improved in weight and hardness so that now in battles tons of metal are fired through great granite fortifications and steel clad ships with greater ease than the old-time round shot could pierce an oak side. Early in the present century methods for throwing hollow shells filled with powder or small shot were invented. From canister, grape and chain shot, there have evolved heavier shells, gener-

ally explosive, but also of such hard and sharply pointed steel that no armor can withstand them. Most of the smaller rifles are equipped with balls that pierce the object aimed at cleanly and without jagged edges. Cases have been known where such a ball passing through a person did not even inflict a severe wound. Such is really the result aimed at in civilized war; either to kill a man outright, or simply temporarily to disable him. Some kinds of shells, however, are diabolical in their intent. Among these is the

Dum-dum Bullet

recently declared barbarous by the Peace Convention at The Hague. Some small shot explode after entering the body;



THE ENGLISH DUM-DUM BULLET.

The recess in the point of the bullet allows the soft lead, of which the interior of the bullet is made, to expand on striking the victim's body; while the nickel sheath breaks into jagged edges and makes frightful wounds.

others, like the dum-dum bullet, flatten out when they strike any object of resistance, because of their soft material, being only partly covered by a nickel envelope, and these at once make fearful, jagged wounds, and are hard to extract. The British are now using in South Africa an awful affair partly covered with copper, but bare at the end, and with a slight opening sawed down into the bullet. When this strikes a victim, the cut closes because of its softness, and the bullet then assumes the shape of a mushroom, as a result making terrible and painful wounds. One of the new inventions along the line of projectiles is what is called

The "Base" Shell

The bottom or blunt end of the shell, which is large and for cannon use, is separate from the rest of the shell. This "base" rests on ball-bearings, and, while the upper portion revolves, it is stationary. Attached to the base and folding up into grooves along the upper part are four murderous scythes. When the shell is thrown from its gun, the rifling of the core starts the point of the shell revolving, the knives, pushed by springs, jump out from the sides of the base, and as they go through the ranks of the enemy cut and maim every man in their course. Then, after its work is nearly complete, it explodes and works more havoc. The knives when outspread cover a diameter of forty-five inches, and it may be imagined what carnage such a missile will create in a rank of closely lined infantry.

Searchlights

have brought about a great revolution in warfare. By their means lights and signals can be thrown many miles, and the work of the enemy in the night detected. The average searchlight is made up of lenses and reflectors so as to condense or diffuse the light of a 25,000 candle-power electric arc lamp. They are made in the shape of a cylinder about thirty inches deep and from two to three feet in diameter. In the back is a silver-backed reflecting lens, and at the front is a glass door. Within is an electric lamp placed at the focusing point of the lens. Between the glass door and the lamp is a smaller reflecting lens that throws the light of the electric lamp into the large lens, and that lens in turn throws the concentrated rays out through the glass door miles and miles into the night. The whole affair is mounted on a pedestal, and can be moved in any direction at will. The rays of light are generally kept together so that a beam 3,000 feet away

covers only the width of fifty feet. This, however, can be changed at will if desired.

Torpedoes

are the dread of all war vessels, and work as much havoc as any other weapon. They are shaped like a cigar, with propeller at the rear and an awful load of dynamite or gun-cotton at the nose. Inside is an electric storage battery attached to a motor that operates the propeller. When ready to be discharged at the enemy, a torpedo is placed in a compressed-air device that shoots it out into the water, aimed in a certain direction. The electric battery has been turned on and the rudders so arranged that the torpedo will travel in a given angle. It drives forward at a great speed, the cap on the nose strikes the side of the ship and discharges the explosive, and the ship is torn into pieces.

Mines are used nowadays for protection of the harbors against an incoming enemy. These are big bombs placed at the bottom of the harbor or straits and connected by electricity so that they may be fired off at will. Charts are made of the harbor, and so figured out that the attendant several miles away can look through a telescope at the approaching enemy, and can tell at just what moment the intruder is over a given mine. He then turns a switch, and the great vessel of steel and iron is blown into the air with a vast volume of water, and rapidly sinks. Some mines are fast to buoys which float at the surface, so that when a vessel coming into the forbidden waters strikes one, an electric spark is carried down to the mine and it explodes.

Among

Machine Guns

the Gatling, Hotchkiss and Maxim are the deadliest because of their rapid fire. The Gatling has a number of barrels joined together side by side, and at a distance looks like a big stubby cannon. There are generally about ten barrels, which revolve upon a pivot. Each chamber has a separate lock which is discharged automatically when the barrel reaches its proper position. The machine is worked by a crank; the cartridges are placed in a rack with grooves that let them slide down into their proper chambers as soon as the fired shells have been ejected. As many as 1,200 shots a minute have been fired by the Gatling gun.

The Maxim differs in that it is wholly automatic; after each recoil of a previous discharge the shock opens the breech, extracts the empty shell, takes a fresh cartridge, cocks the gun, pushes the shell into its chamber and fires the gun. The cartridges are loaded into the gun in a belt, and all the operator has to do is to pull the trigger the first time, and the belt is ground through the machine at the rate of 600 shots a minute.

The Armstrong gun is the largest of the rapid-fire guns. It is for large caliber shells, using 4½ pounds of smokeless powder, and throwing six-inch projectiles weighing 100 pounds with enough force to penetrate fifteen inches of wrought iron. A smaller gun of the same order fires forty-five pound shells at the rate of fifteen per minute.

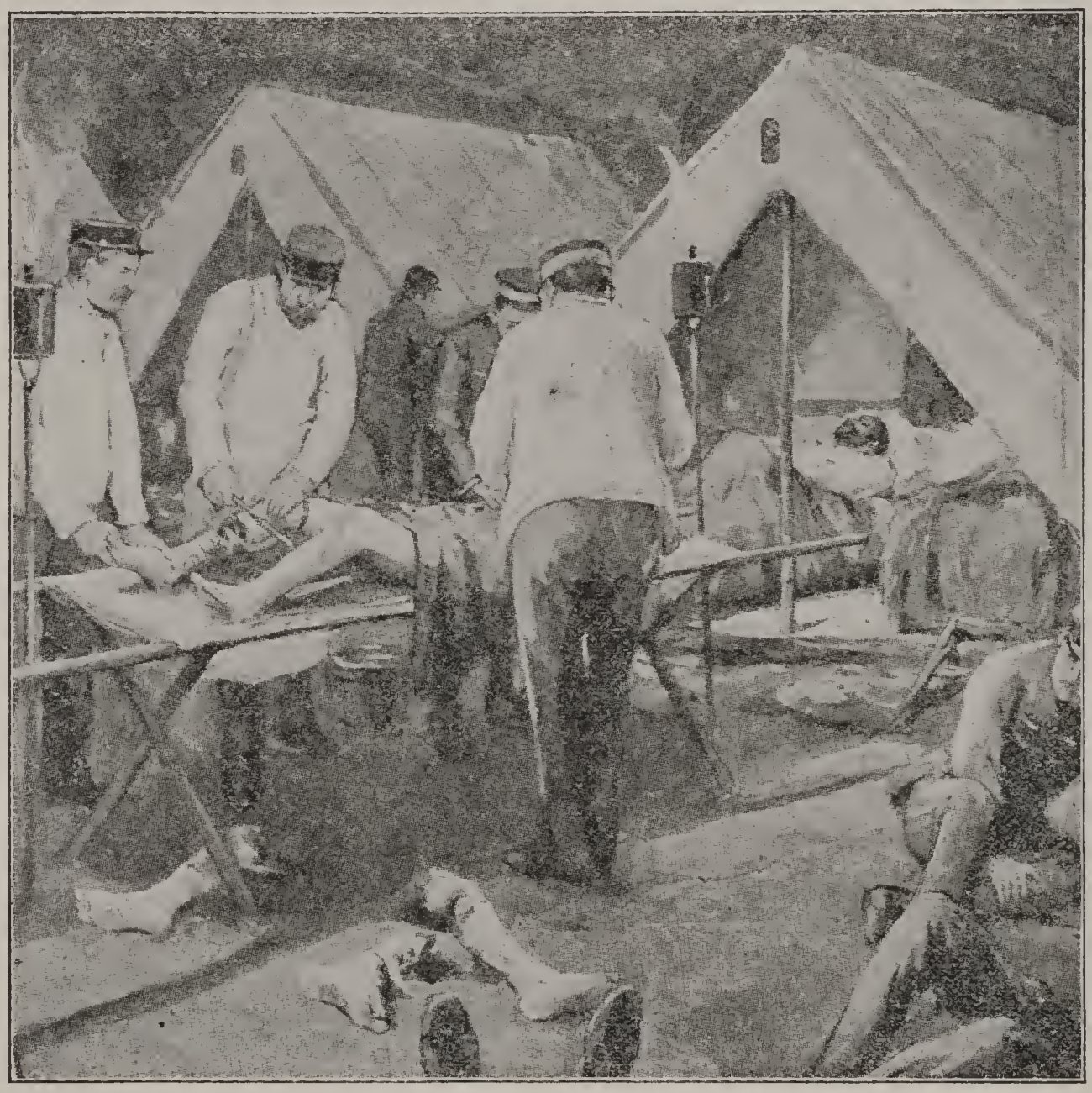
The Driggs-Schroeder and Hotchkiss rapid-fire guns are inventions of Americans, and are used largely on our battle ships, especially in the "fighting tops." These swing on pivots, so that they may be directed to any quarter. They fire one shot at a time, and to aim the gun an arm-piece similar to that of a rifle is attached. The gunner presses this against his shoulder and steadies it, while his two hands remain free to open the chamber, insert a shell, pull the trigger, and reload. It fires still projectiles with great

force and at the rate of thirty-six shots a minute.

Enormous strides have been made in the upbuilding of the

American Navy

since the Spanish-American war. Many new craft have been added, but in the battleship class the effectiveness of our fighting ships has been prodigiously increased. Six new monsters of the finest type are under way: the Kearsarge, Kentucky, Alabama, Illinois, Wisconsin, and the new Maine. The measurements of the Kearsarge and Kentucky are: Water-line length, 368 feet; displacement, 11,525 tons; speed, 16 knots; horse power, 10,000; water-line armor belt, 16½ inches; side armor above belt, 6 inches; turret armor, 17 and 15 inches; conning tower, 10 inches; protective deck, 2¾ inches. Armament: Main battery, 4 thirteen-inch guns; submain battery, 4 eight-inch guns; secondary battery, 14 five-inch rapid-fire guns, and 20 six-pound rapid-fire guns. The enormous projectiles thrown from the main-battery guns weigh 1,100 pounds, leave the muzzle with 33,627 foot tons energy, and have the power of penetrating 34½ inches of wrought iron.



CARING FOR THE WOUNDED.

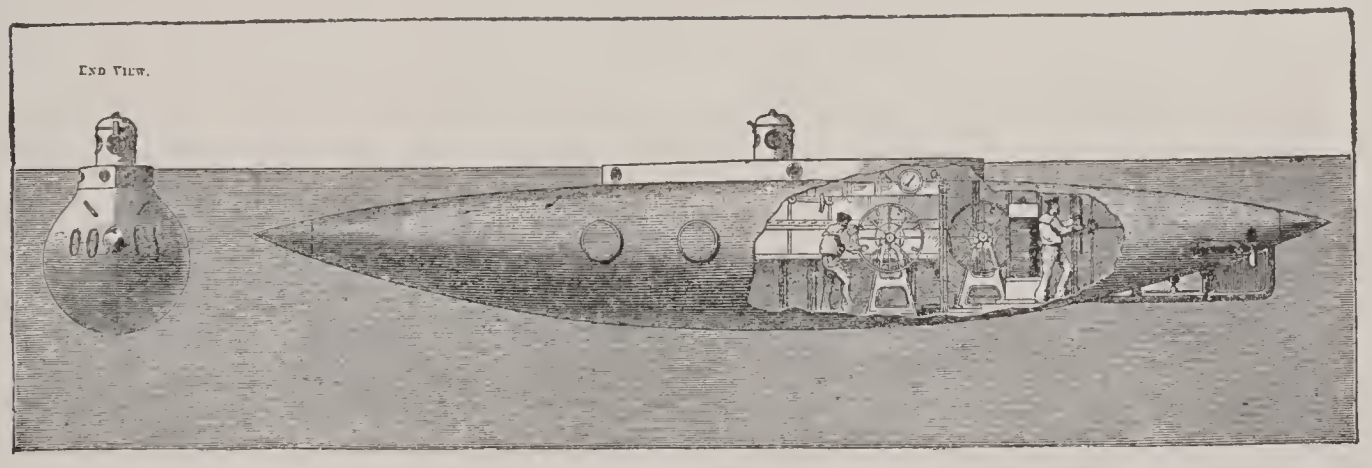
A scene in a modern U. S. field hospital during the late war with Spain.

Besides the heavy war vessels, the navy is being equipped with a new class of peace ships. Six cruisers are soon to be built that are not intended for battle with war ships of the enemy. Their duties

will lie in capturing or annoying the merchantmen and unprotected harbor towns of the enemy, and policing the sea. They are especially adapted to tropical waters, carry plenty of coal, and are light enough to enter shallow water. They are to be built of steel, but their bottoms and sides up to a minimum of two feet above the water line are to be sheathed with heavy planking, which in turn is to be covered with copper. This copper covering is to avoid barnacles and the like which grow on the bottoms and sides, and materially hamper marine movements. Very little wood is to be used on the vessels, for it has been found that breaking beams splinter and cause more wounds than bullets. They will measure 308 feet 2 inches over all, 53 feet wide; full draft when loaded, 16 feet 8 inches; displacement, 3,400 tons; horse power, 4,500; coal capacity, 700 tons, and speed 16½ knots. All the latest methods of electric lighting, heavy engines and the like will enable them to carry crews of 290 men 9,800 miles without other supply

The Largest Searchlight

ever made is the one that was exhibited on the roof of the Manufactures Building at the World's Columbian Exposition, and which is now installed in the observatory on the summit of Mt. Lowe, California. It has the power of 3,000,000 candles and throws a strong light 150 miles. Its reflecting lens weighs 800 pounds, is three-fourths of an inch thick at the edges and one-sixteenth in the center, and is encased in metal rings weighing 750 pounds. The whole light is 11 feet high and weighs 6,000 pounds, yet is so delicately poised that a child can move it in any direction.



SUBMARINE BOAT WORKING BY ELECTRIC POWER

"SKYSCRAPERS."

THE MODERN PUEBLO VILLAGE; WHOLE TOWNS IN THE TALL BUILDING OF TO-DAY.

TEN years ago, when the first "skyscraper," the Tacoma building, was begun in Chicago, it was supposed that the Pyramids and a few of the great cathedrals were the largest buildings that were likely ever to be erected. To-day we have tall bridge-like edifices that almost overtop these landmarks and seem to brush the skies. The development of the tall building generally known as the "skyscraper" came about in the natural course of improvements in building, but it has wrought one of the greatest revolutions, though peaceful, that has ever been witnessed.

When land values in the great cities began to go up several figures at a jump, the question was asked, "Where are we going to conduct our business?" Land was occupied in the mercantile centers, and since the buildings could not spread out they must increase in height. This went on in a meager sort of way, for people did not like climbing up several stories to their offices. Then came the elevator, and with it the study of how best to increase the height of the office buildings.

It had always been supposed that the walls were the main support for the floors and the rest of the structure, but one day an engineer came along who reversed this method. He argued that by making the framework of steel and fastened together like a cantilever bridge, there ought to be strength enough to support the outside covering. And such has been the method of building since, called

"Chicago Construction."

But the problem was not nearly worked out, for with increased height there must be increased strength in the foundations. This meant a study of the soil to see if it would bear such great weights, and what would be the best method of keeping the structure from leaning out of plumb. The result has been that building has now become almost a branch of civil engineering.

Let us observe the rearing of one of these cities in miniature, with its railway-like elevators carrying thousands of passengers and freight daily, with its own electric light and power plants, its restaurants and hotels, its libraries for the tenants, its telephone "central" and telegraph lines, its laundries, fire apparatus and trained fire departments, barber shops, postoffices, superintendents, detectives, and corps of workmen.

The Tallest Building

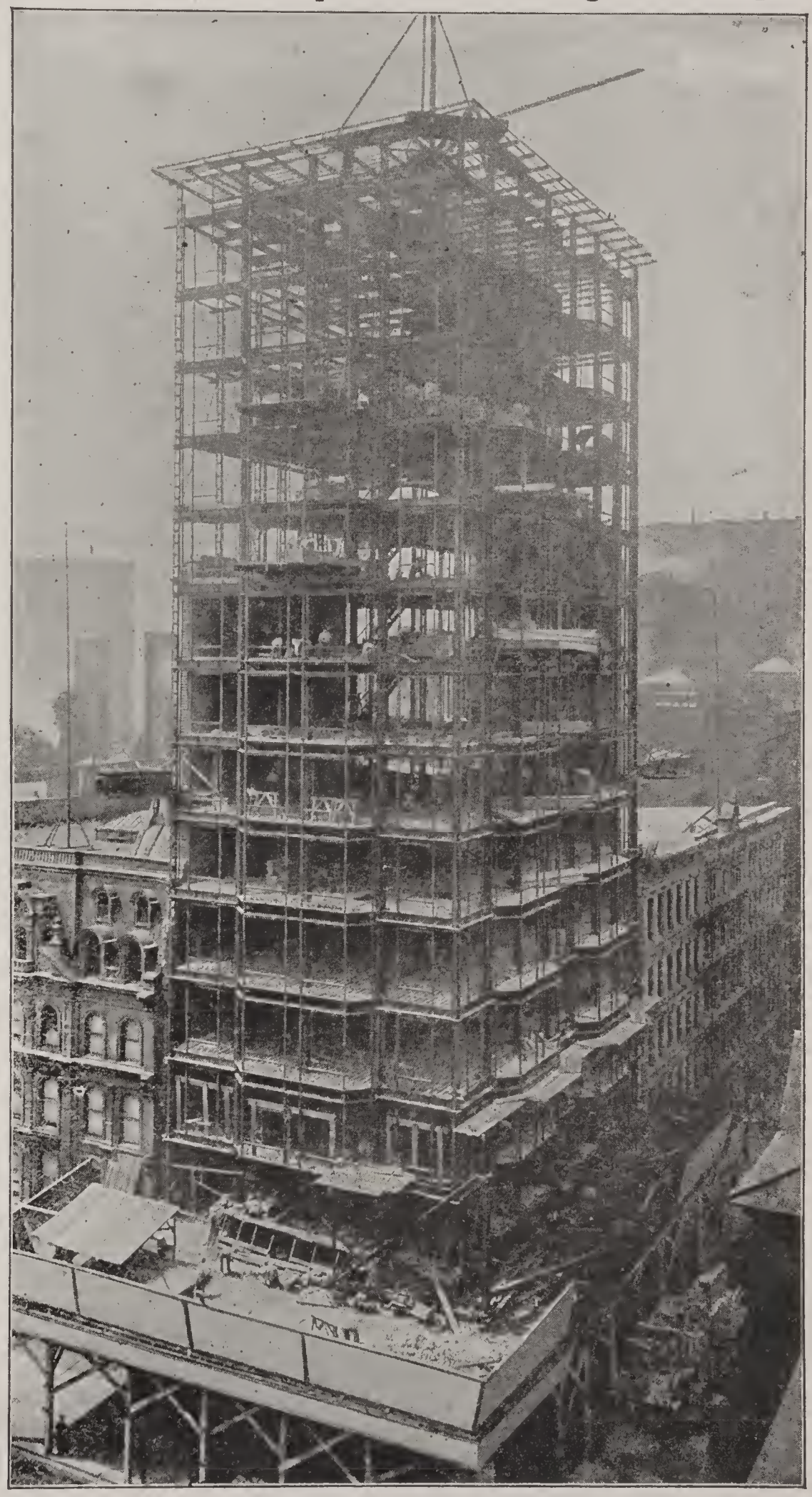
of to-day is the Park Row, in New York city, designed by R. H. Robertson. It is twenty-nine stories in height and measures from the bottom of its foundation to the top of its flag pole 501 feet, or nearly one-tenth of a mile. Its weight is about 20,000 tons, and when loaded with its "live" weight of tenants, furniture, etc., the total pressure upon the foundation

piles is about 61,400 tons. It may well be imagined what is the amount of steel, stone, bricks, cement, glass, etc., that is needed in the construction of such a monster, and yet the rapidity with which these buildings are erected is still more amazing.

First the soil is probed to see of what nature it is. In Chicago,—which, by the way, is almost a floating city because of the thin crust of earth that rests on a large bed of ooze,—the building problem is different from that in New York, where the ground is largely sandy with rock bottom.

Great Pile-Drivers

with hundred-ton hammers, pound down into the ground to great depths long pine piles, sometimes, as in the Park Row building, forty feet long, and as many as 1,200 in number. The piles are placed about two feet apart and in rows that will be directly under the great vertical columns that are to support the great weight of the completed building. On top of these piles and about their upper ends is poured concrete, which hardens and becomes a solid rock-like substance, resting securely upon the piles. Sometimes criss-cross arrangements of steel rails are imbedded in the concrete, and, when it has hardened, there is presented as a first foundation a mass of steel and rock that it would seem no force or time could conquer. Resting on this sub-foundation are huge blocks of granite, and above them the brick piers of the building. The weight of



A MODERN "SKYSCRAPER"

Showing the framework up, and several floors laid. Ready to put on the walls of the lower stories.

the building is not allowed to come directly on the granite, but huge steel beams, some of them eight by fifty feet, and weighing more than fifty tons, are placed between the foundations and the bases of the upright steel girders about which the "skyscraper" is to be built. This distributes the weight to every part of the foundation. Above the surface a great steel framework rises, which, before the walls are on, looks a great deal like an immense house of cards.

The enormous steel girders that make up the frame are all riveted together in every available place. It is said that if a storm great enough to disturb one of these skyscrapers came along the building would hang together, even if it were blown entirely over. The outer walls of this great box-like frame are very thin when compared to its height. If the old method of using the walls as support for the floors were used, the walls at the bottom would have to be so thick that there would be no open space for use, while the weight would be so great that no foundation would support it. The material varies; often it is of terra cotta, and sometimes of brick and stone. It is fastened securely upon the framework, and the lower walls give but little support to those above.

The floors are made, as are also the walls, entirely of hollow,

Fireproof Brick;

and some buildings have not even wooden laths, but rather arrangements of thin steel or tin upon which the plaster is laid. Thus a fire may burn out the fittings of one room, yet not spread to another.

The cost of the Park Row building was $2,400,000, but the income from its rents is more every year than the taxes of a small city. It contains 950 rooms, and will accommodate tens of thousands of people. The elevators carry over 50,000 people daily.

The question whether the "skyscraper" has reached its limit is not as yet answered. Cities are enacting building laws regulating the height of buildings. Fires disastrous in their results have recently broken out in New York, which threatens the increase of height. It remains to be seen whether steel will last long enough without rusting, though at present, examinations of steel girders erected ten years ago show no such decay. Whatever the future of the tall buildings is, all modern improvements in buildings take on the aspect of the "skyscraper."

Compressed Air and Pneumatic Tubes.

HOW MAIL AND EXPRESS PACKAGES ARE SENT MILES UNDERGROUND BY AIR ALONE.

AIR compressed into a smaller space than it normally occupies exerts a powerful pressure, for being a gas of a certain density it needs a certain amount of room. When, then, by means of a compressor or pump we force air into a small receiver the tendency is for the tiny atoms that make it up to push one against the other for more room and try to get away. This powerful agent is easily obtained, and when stored up in tanks may be used in any one of some hundreds of ways. When conducted through a pipe with a faucet nozzle the air may be used for blowing dust out of carpets and upholstery, as well as for applying paint to high ceilings. Chemical experiments are made daily with its aid. Power is applied for running cars, elevators, automobiles, electric dynamos, and many other such affairs. Liquid air was discovered only by its aid, and the great system of sending packages in pneumatic tubes from floor to floor of the great department stores, mail from city to city, and messages underground from the great press associations to the newspapers, saves much time and expense. Recently a pneumatic tube system was opened between the New York City postoffice in the city hall at New York with that of Brooklyn. A tube eight inches in diameter and over a half-mile long passing over the Brooklyn Bridge thus hourly saves the use of many wagons and messengers. Possibly as fine a system as any is that which was recently installed in the Waldorf-Astoria Hotel in New York City, though the placing of the tubes in the walls of the building is a great deal easier than running them under the ground in conduits, as are those that connect all the great newspaper offices with the telegraph companies.

This great hotel has 1,200 rooms, and on an average entertains 1,500 guests; it is sixteen floors high, so that it may readily be seen what an army of pages and clerks it would take to sort and deliver 6,000 pieces of mail and 2,000 newspapers that are received every day, without the aid of some such device as its pneumatic tube system. In the basement of the hotel is a

Pump-Like Engine

that compresses the air to a pressure of from two to three pounds to the square inch. The compressed air is stored in a large tank, from which run two large mains or pipes, one to the "central" station on the main floor, where the boxes are shot up to the different floors, and another that leads up to the top of the building. The latter has fourteen

branches, one leading to each of the first fourteen floors, each one ending in receivers specially adapted to the system. These two mains and their branches supply air under pressure to the other tubes that are to carry the messages. Now, leading from each station on the upper floors down to the "central" on the main floor are separate transmission tubes made of seamless brass tubing three inches in diameter, which do the carrying. Thus, at the main station there is a long row of receivers, fourteen in all, each numbered and leading to its respective floor. Little boxes to fit the tubing, and having fur on the ends so as not to stand still and let the air pass around them when in the tube, are employed to shoot through these pipes, while longer ones ten inches in length are used for carrying newspapers. When it is desired to send up mail or a visitor's card to an occupant on an upper floor the attendant at "central" places the message in one of the boxes, shoves the box into the receiver, and then pushes a rod which in turn actuates machinery that lets a little air into the tube. This causes a current sufficient to carry the box up to the end of its tube, where it is dumped out. The attendant at this station hands the message to a page in waiting, who carries it to the proper room.

Some systems have two sets of pipes through which all the time there is flowing a strong current of air, one pipe leading up, the other down. This, however, is done away with by the system just described, one tube sufficing for messages either way. On election nights when newspapers are rushed to get the news, and thousands of telegrams are being sent and received hourly, this is the only method which could be used.

Modern Illustrating.

HALF-TONE AND COLORTYPE ENGRAVING.

ASIDE from the method known as zinc-etching (see article on Modern Newspaper) there are several other processes, such as wood-cuts, half-tones and colortypes. Wood-cuts, as their name implies, are engravings on blocks of wood, and are of the earlier method of engraving. With these very fine detail in lights and shadows can be obtained. but for rapid and inexpensive work the photo-engraving processes are used in the main. The zinc method for outline cuts, or cuts where there are no other tones or colors other than black with the blank space white, is as good a process as could be desired, but it can readily be noticed that in reproducing photographs there are some shadows more intense than others and some lights brighter. Zinc etching cannot

possibly bring out anything but white and black, so the half-tones or lighter shadows had to be produced by some other method.

It was found that by photographing the object desired through a fine screen of muslin or

Wire Gauze

or lines scratched on a glass plate and then filled up with ink, the little squares in the screen would separate the rays of light according to the strength of the light or shadow of the picture. Where the shadows are intense the rays run together so that the effect on the plate is of the black shadow running all together, but where they are lighter the rays come upon the plate differently and form little dots, while in the high lights or white places the plate is still more dotted. If you will take a magnifying glass and examine a half-tone you will see that the whole picture is made up of little cross-bars. This is the effect of the screen, and is called "stippling." The screen is placed just in front of the plate to be photographed upon in the camera, and as the rays of light come in through the lens they are diffused according to the intensity of the light or shadows in the object being photographed. The screen is ruled in little bars with lines from 80 to 150 to the inch. These are so small that they hardly appear as lines when the cut is viewed a little ways off, yet they accomplish the work of collecting the different grades of half-tones, and produce a picture after being etched on copper or brass plates almost a counterpart of the photograph.

The Colortype

is worked out on the same line, that is, with a screen to stipple or grain the plate, but a further process of using different colored inks is used which in the end gives the effect of photographs in color. The process consists in having three different half-tone plates made of the same subject, which are used respectively with three different inks: red, yellow, and blue. These three colors when combined in proper amounts by printing one on top of the other will give any shade of color desired. The subject to be printed is carefully studied as to its color, and the proper combination of the inks to produce the desired colors is decided. Then one plate is arranged for printing, let us say, in blue. All that portion of the picture that is to appear in heavy blue has a heavy surface on the engraving; the lighter shades are stippled more, or eaten out; while that portion which needs blue in combination with one or both of the other colors is shaded in proportion. This plate, after being "blocked" with color thus, is marked near the edges with

"Register Marks"

which aid in printing the next color exactly on top of the other at the proper place. Then the yellow plate is prepared in the same manner, and then the red. Proofs of each plate are taken separately and together, to see if the right color scale has been worked out. If the final proof is correct, all the register marks on the several plates should print exactly one over the other and not blur, forming a single mark. When this is done, we have as a result a perfect colortype or picture resembling a photographic half-tone, only in natural colors. The greatest difficulty in this kind of engraving is that the operator must thoroughly understand the effects of one color upon the other, and be able to know what degrees of intensity of the primary colors must be used to combine at last into the perfect and natural shade.

The Meat Market of the World.

The Union Stock Yards, of Chicago, Where Millions of Dollars, Worth of Cattle, Hogs, and Sheep are Slaughtered Daily and Shipped To Every Quarter of the Globe.

CHICAGO supplies the world with meat. Daily there passes through the great Stock Yards on the southwest side of the city millions of dollars, worth of cattle, hogs, and sheep, beside vast numbers of horses, to be shipped to all parts of the globe. These yards gain their name by reason of the numerous railway lines that surround them in a square, and which bring here from all parts of the stock-raising country vast herds to be slaughtered and packed.

"KNOCKING" CATTLE IN THE KILLING PEN.

The Union Stock Yards is a corporation, virtually a monopoly, and has many of the powers of a municipality. Within its gates enter every morning, between 4:30 a. m. and 9 a. m., some 28,000 persons, while there are employed in both the yards proper and "Packington," which is always considered a part of the yards, about 35,000 people. In 1899 the total receipts of animals were about 2,500,000 cattle, 140,000 calves, 9,200,000 hogs, 3,700,000 sheep, and 120,000 horses (for this yard is also the greatest horse market in the world). To bring this stock to market required nearly 300,000 cars, or a train over 300 miles long. The Stock Yards Company controls all manner of industries within its grounds, from water plants and fire departments to restaurants and boot-blacking stands.

When a load of stock is run in on the side track, the cattle or hogs are run into chutes by the company and locked up until the man to whom they are consigned sends for them. Then a "key-man" opens the chute and gives the animals into the care of the consignee. This man may be

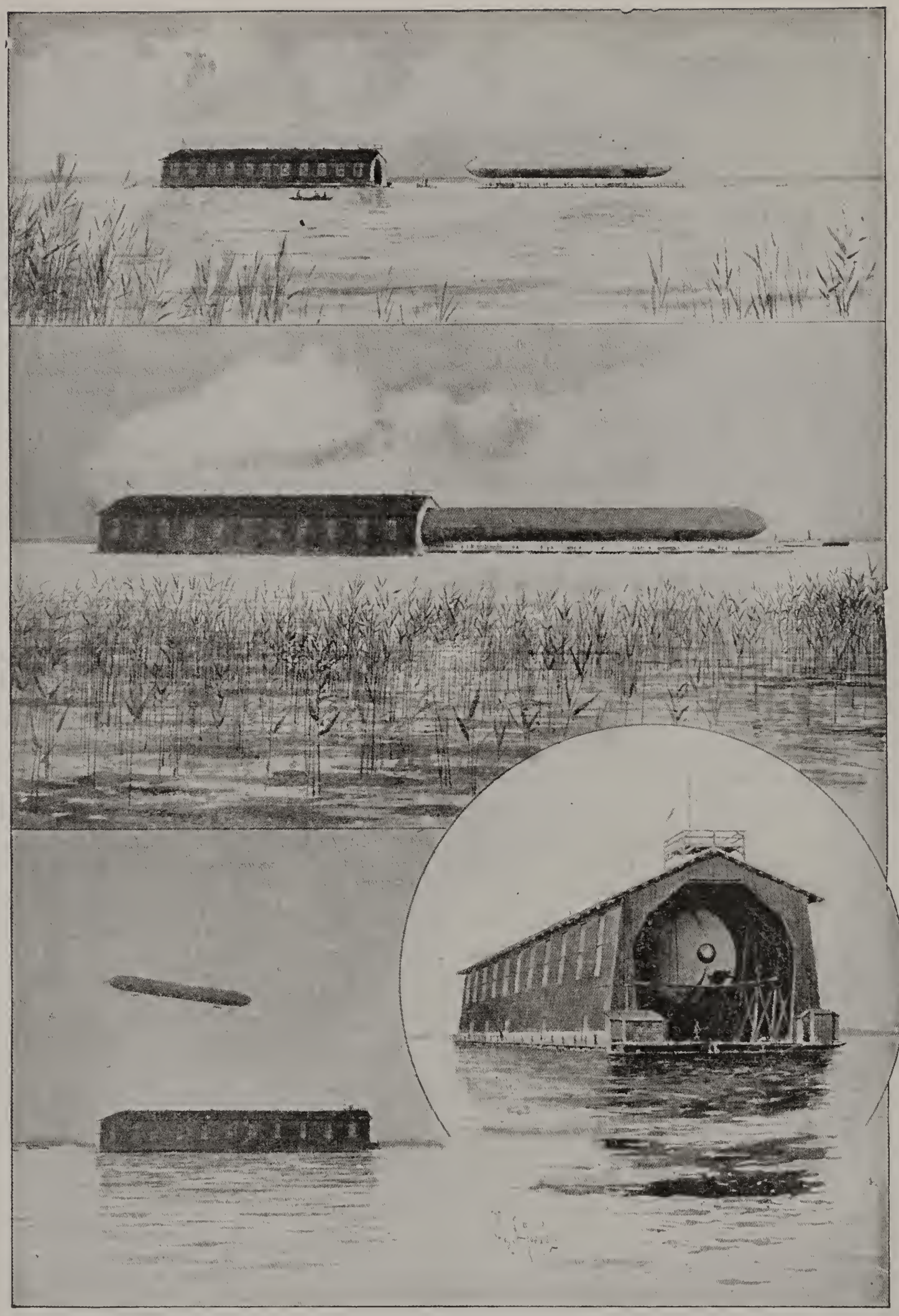
TALKING WITH A MEGAPHONE

THE MEGAPHONE IS USED ON THE OCEAN, ON BATTLE-FIELDS AND IN VARIOUS SITUATIONS WHERE THE HUMAN VOICE WITHOUT THE AID OF THIS INSTRUMENT WOULD NOT BE HEARD

WEIGHING GOLD IN THE KLONDIKE—SCENE IN THE BANK OF BRITISH NORTH AMERICA

SALUTE BY INDIANS TO A DEAD CHIEF

IT IS CUSTOMARY FOR INDIANS TO PAY RESPECT TO THE MEMORY OF A CHIEF WHO HAS GONE TO THE HAPPY HUNTING-GROUNDS BY A FEW WORDS OF A WAR-SONG, A WARWHOOP OR HOLDING UP THEIR PIPES TO THE DEAD BODY



AERIAL NAVIGATION—ZEPPELIN'S AIR-SHIP

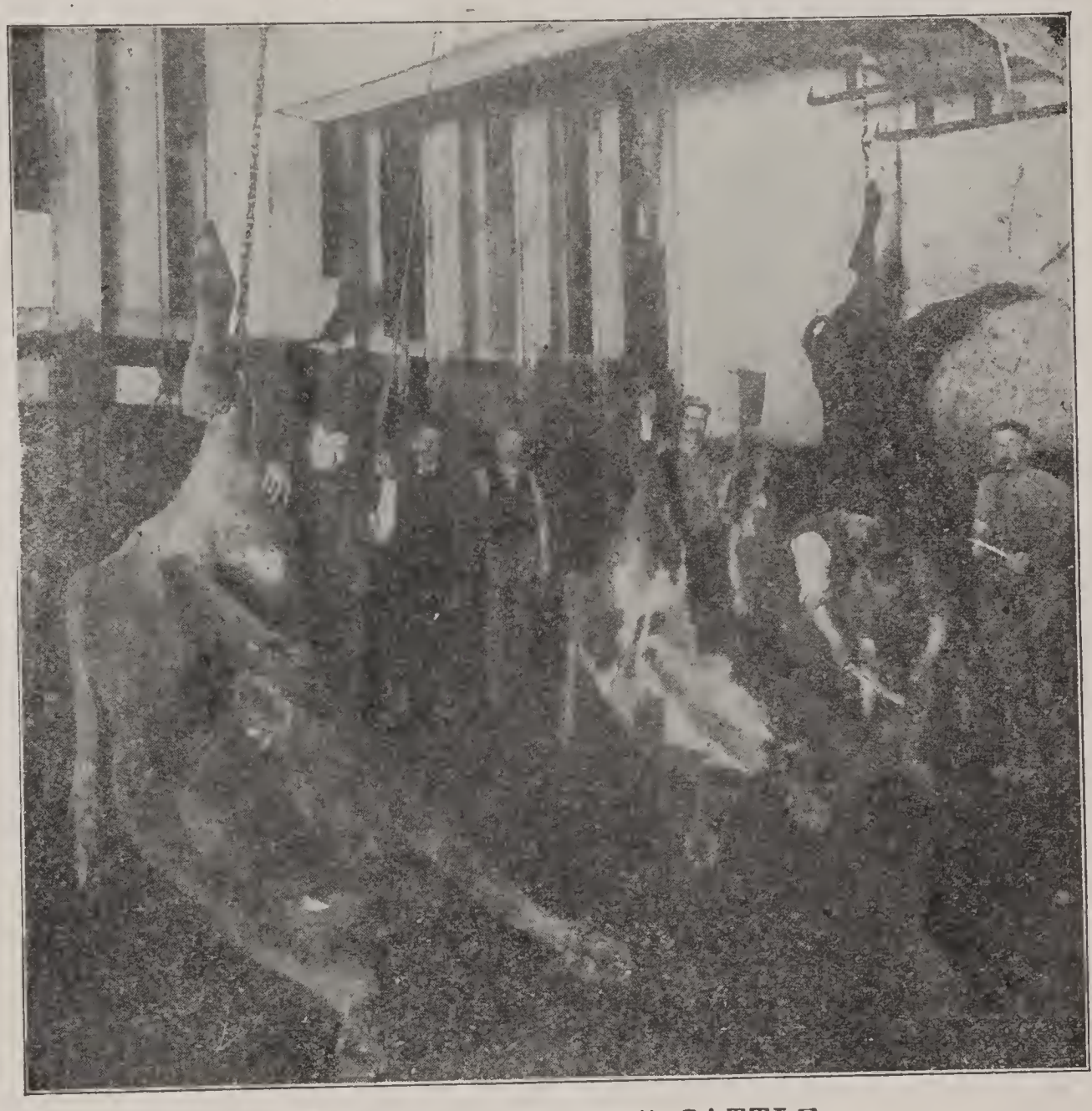
1. AIRSHIP CONVEYED TO THE SHED BY A TUG. 2. THE AIRSHIP BEING TAKEN FROM THE SHED. 3. THE AIR-SHIP STARTING. 4. THE AIR-SHIP IN ITS SHED.

a packer or a commission man. From the chutes the animals are driven to pens that custom has given to each particular firm. Here they are inspected and sold. As they go to the scales and are weighed government inspectors throw out poor stock, while a public shrinker docks some animals that are not in the best condition from forty to eighty pounds. Condemned animals have a tag fastened in their ears. Three main sections in the yards are laid off for cattle, sheep, and hogs. The cattle pens are large, roomy places which will hold several car-loads, and are brick paved. The pens for hogs are double-decked, that is, like a two-story house, one pen over the other. The sheep are all taken to a roofed place called the "sheep-house."

The Pens

are divided into blocks and divisions just like a township, to facilitate in locating stock. The yards cover no less than 475 acres, 320 of which are covered with plank flooring. There are 13,000 pens, 8,500 of which are covered for housing hogs and sheep. The divisions and blocks lay out the place with twenty-five miles of streets, while there are thirty-eight miles of water troughs for watering stock, ninety miles of water pipe and fifteen miles of sewers Six artesian wells furnish the water supply, and in summer time the tanks and reservoirs hold water for emergency to the amount of 8,000,000 gallons. Owners are put to no trouble in the handling of stock, for all kinds of feed are delivered to the pens by the company, and the watering, feeding and yarding is all conducted under its care at reasonable cost. Two hundred commission firms located at this market make competition acute. A thorough system of inspection for disease by government officials makes it almost impossible for unhealthy stock to be sold. And when one considers that in one year $230,000,000 worth of stock is yarded by the company and it seldom occurs that a single head is lost, one can possibly understand the magnitude of this great buying and selling center.

But aside from the simple handling of



KILLING "KOSHER" CATTLE.
For Jewish customers meat must be dressed with especial religious rites.

stock by commission men and speculators, the Stock Yards are noted for the latest and fastest methods for killing, packing and shipping to all points of the globe the meat supply of all humanity. The largest packers at Chicago include Armour & Co., Swift & Co., Nelson Morris & Co., Libby, McNeil & Libby, and the Cudahys. All these firms are capitalized in the millions, and nearly all have branch yards and packing houses at Kansas City, Omaha, St. Louis, and several other points, while they are represented by salesmen and markets all over the world. To give an idea of the immensity of one of these concerns the following figures are given: One company in 1898 purchased live stock to the aggregate of 1,437,844 cattle, 2,658,951 sheep, and 3,928,659 hogs. Sales the same year amounted to $150,000,000, and the total number of cars needed to carry the meats was 107,684. From this number of live stock there were made 196,244,585 pounds of lard, 6,472,857 pounds of wool, 3,888,983 pounds of neatsfoot oil, 5,487,540 pounds of glue, 8,116,338 pounds of butterine, 26,009,453 pounds of tallow and grease, 61,635,047 pounds of oil, 90,079,748 pounds of hides, and 86,226,576 pounds of fertilizer. This same company's plant at Chicago extends over forty acres of land, of which thirty-eight acres are covered by buildings, the latter having floor space to the area of sixty-seven acres. Twenty-five engines with eighty-one boilers and 12 dynamos supply the plant with power and light, while seven refrigerating machines with 125 miles of pipe have a capacity of cooling 1,400 tons of meat daily. The storage and cooling rooms have a capacity of 5,000 cattle, 7,500 sheep, and 12,000 hogs. Six thousand and eighty-five employés that carry on this gigantic enterprise necessitate a weekly pay roll of $70,000.

IN THE HOG "STICKING-PEN."
Showing a sticker in the act of killing.

Numerous methods are used for

Killing

and preparing the stock for consumption. The cattle are driven from the buying pens over long runways to pens near the slaughter houses. From these they are run one by one into pens within the house, each just large enough for one animal. Platforms run along the side of these pens and level with the top. Along these platforms walk men with small sledge-hammers, and when just above a steer, one of them will suddenly swing the ham-

mer with stunning force upon the head of the animal just between the horns. The animal drops to the floor, and then a gate is swung up, the floor turns upward on one side upon a pivot, and the animal rolls out, only to be quickly jerked to the ceiling by a chain fastened about one hoof. At once the throat is cut, and the head removed; the animal is drained of blood, and then in quick stages the hide, hoofs, shanks and inwards are removed, and sorted to their various departments. The "splitter" comes along and splits the animal down the backbone. All this time the carcass has been traveling upon an endless trolley; and now, after it has been washed and cooled, it is ready to be stored in the great refrigerating rooms, whence it comes later wrapped in cloth and is shipped away in specially prepared refrigerator cars all over the world. For Jewish customers a special killing is necessary because of the tenets of their religion that will not allow them to eat meat other than that killed by an ordained rabbi, or which has ever had a broken limb. Instead of using the hammer for stunning, the animal is first tied by the feet, then raised in the air by the one hind foot. A killer appointed by a rabbi comes along murmuring a prayer, and with a quick slash cuts the animal's throat. This process is called

UNITED STATES INSPECTORS MARKING HOGS TO BE SHIPPED.

Killing "Kosher,"

and is very rapid, in one plant 250 being killed and dressed an hour.

With sheep the process is similar to other killings, only the sheep are suspended two by two on hooks that run along a continuous trolley line. As each set passes a certain station a certain part of the process is completed. The killer sticks the knife in their throats at the rate of twenty a minute; then the animal moves along to each specialist until the carcass appears at the end of the trolley held apart with wooden sticks, ready for the chilling room. With this branch of slaughtering as with others, the Jewish method necessitates a special slayer, who places the edge of the knife between his lips and mutters a prayer before every death stroke.

With

Hogs

an odd device like a great drum, with six hooks at intervals on each side, revolves by machinery. Each hook is so arranged with a little wheel that, when a hog is fastened to one as the drum revolves, the hog is jerked with it till it reaches its highest point, when the little wheel slips

on to the rail of a trolley and the hog is quickly run down to the killer. This man makes the quickest killing of any, numbering about twenty-five strokes per minute, while 550 wholly dressed hogs are turned out from one plant each hour. From the killer the hogs go to the "gutter," and then to the scalding trough, where in boiling hot water and with the aid of a scraping machine most of their hair is removed. Next in a cooler bath the last vestige of hair is scraped away by hand. From here the carcass goes through the general process of cutting up, only with hogs the cutting is in smaller pieces. The leaf lard is sent to markets or to the refinery; the sides are pressed into shape for bacons by hydraulic presses, while odd bits and cuttings are sliced off here and there and shot through tin chutes hundreds of feet long to other parts of the building, where they are packed in boxes ready for shipment.

The process of killing must for facility be divided so that each man does but one part of the work; thus, one man kills, one man "guts," another removes the hide, another chops off the hocks, while still others split and divide the carcass into marketable shape. The animal is always yet warm ere the process is complete, and in from three to five minutes after the live animal is driven into the pen, the meat is ready for cooling. It is remarkable that not an ounce of a slaughtered animal goes to waste. Every part that cannot be used directly for food, wool, leather or oil goes to the "tank" and is refined into glue.

CHICKEN KILLING.

With a corps of eighty men, 10,000 chickens, 8,000 ducks or 6,000 turkeys are killed and dressed by the above illustrated process every day. Each operator has his certain work to do; one man fastens the fowl's legs to the hooks on the endless chain, and also hangs a little can to its neck just below the bill. The chain moves on, a man sticks an awl through the neck of the fowl, and the blood drips out into the can, whence it is sent to the "tank" for fertilizer. Then as the chain goes on each man plucks his part of the feathers till all is done.

Great Governments of the World.

HOW THE NATIONS OF TO-DAY GOVERN THEIR PEOPLE.

GOVERNMENT has existed since the birth of man. Opinions differ with people and nations as to the goal to be reached by this or that method, but the intelligent person watches with interest the growth in any form of the great science of politics and government. The entire human family has undergone, or is still undergoing, vital changes of government and mutual relationship. A glance at the various governments in operation throughout the world at the present time will reveal the important fact that few, if any, of the methods familiar in the pages of history are absent from the list. We still have the savage communities, which involve almost an obliteration of the family relation rather than the existence of one large family; there are the nomadic hordes and camp-followers, grazing their herds on the edges of the desert at one time, and threatening to overthrow the world at another. Some countries still think the individual exists for the benefit of the government rather than the government for the governed. Let us glance at some of the larger nations with their most improved and enlightened methods of government, as well as their errors.

FRANCE.

In France, as much possibly as in any other great government, we have the extremes democracy and monarchy combined. When the old monarchy went to pieces under Louis XVI., the masses were afraid to trust any of the aristocracy with the reins of government, and, accordingly, boards were appointed to manage the different departments. When Napoleon assumed control, however, it was an easy matter to place trusty tools or single officers in charge. After him came changes of republics and empires until to-day, under the third republic, we have a system of government combining the features gained from the advanced republican thinkers of France (the country most advanced in theoretical republicanism) with those of a strongly centralized military rule. One cannot study the government of this powerful republic without taking into consideration the enormous power wielded by the army, and the almost implicit confidence placed by the common people in that body.

A national assembly, elected to treat with Germany after the Franco-Prussian War in 1871, found itself in control of the government, and while the members were largely monarchists, the general tendency

of France as a whole was toward the republican form of government, therefore the assembly dared do nothing but draw up a republican constitution. To be sure, the constitution was rather meager, and tended strongly towards the monarchical, and it was not submitted to the people for approval, nor is such now necessary. We have, therefore, these two tendencies of monarchy and republicanism struggling for supremacy.

The divisions of France for electoral and administrative purposes are eighty-six departments, which are divided into smaller districts,—362 in all,—which are in turn divided into still smaller cantons, 2,899 in number, while the smallest subdivision is the commune, of which France has 36,170. Three sides of government exist, the legislative, executive and judicial, though all are so centralized that a comparison to the government of the United States would be entirely out of place.

The Legislative Department

is divided into a chamber of deputies and a senate, members of the first to the number of 584 being elected for four years, while those of the senate are elected for nine years, one-third retiring every three years. Each male citizen of twenty-one years who has resided six months in a commune, and who is not disqualified, may vote. Deputies must be citizens twenty-five years old, and receive $1,800 a year and free transportation on all railways. As a rule they are men of ordinary caliber, being retired business men, doctors and farmers. Senators are forty years old or more, and average sixty-three years, with salary the same as the deputies. The deputies are elected directly from the districts, though some of these are so large that two or more constituencies are made from them. Election day is set by government and not by law, and always comes on Sunday. If no candidate receives an absolute majority of all the votes cast, and at least one-fourth of the registered voters in his constituency, another election is held in two weeks, in which a simple plurality elects, and if a tie occurs, the oldest man is chosen. Senators are chosen from departments by electoral colleges (bodies of men elected for the purpose) composed of three classes: first, of delegates chosen from the municipal councils of the different Communes in the Department; second, of senators and Deputies of the Department; third, of members of the council general of the Department, and of the members of the different councils in the Districts of the Department. The senators are not often men of national reputation, but retired professional men from the country towns. The work of the senate is not much beyond that of deciding with the president when the chamber of deputies shall be dissolved, and that of sitting as high court for impeachments and trials of persons who threaten the existence of the state. In general it is a body inferior to the chamber.

The President of France

is elected by a majority of the chamber and senate sitting in joint session, and no member of the royal family may hold the office. The president's salary is $125,000 yearly, with a great retinue of servants and the free use of the palace (Palais d'Elysees) in Paris. He has no veto on legislation, though he may return a bill for a second vote. He may adjourn the houses, though only for a month; may close a session over five months old, and with the consent of the senate may dissolve the chamber of deputies. The president has for his advisers a cabinet of eleven ministers of the different portfolios of finance, war, marine and the colonies, foreign affairs, etc., whose salaries are each $12,000 a year. These ministers are

chosen by the president with a view to their influence in the respective house of which they may be members, and generally with the advice of the presidents of the two houses. They really frame the legislation of the administration, and must sanction the acts of the president ere they are effective. They speak in both houses, whether they are members or not, but when they cannot control the bodies in legislation they are forced to resign, and a new cabinet is chosen. The smallest factional fight will defeat a cabinet, the average life of the cabinet being about eight or ten months. And yet the government is largely that of the cabinet rather than of the president, for the latter really has no very great powers, and is more a luxurious figurehead than anything else.

Legislative Methods

begin with a choice of eleven bureaus in the chamber by lot at the start of each annual session, while nine are selected in the same manner by the senate. These bureaus choose from their numbers a monthly committee on parliamentary initiative, to which all bills are first referred, when presented, to decide if they are worthy of consideration. This committee practically passes all serious bills, and after printing them refers them to their respective bureaus. The bureau selects a sub-committee for study of the bill, though this is generally on party lines. After the bill has been amended to suit the committee, it is presented before the chamber by a commissioner, who does not speak from his seat, but from a "tribune" above and behind the chair of the president of the house. The speaker (president of the chamber) has nothing of the great power wielded by the same officer of the United States, though he is elected by party rule. French parliamentary practice differs greatly from that of almost any other country, it being nothing uncommon for members to shout out their opinions of disapproval of the person speaking, and even the speaker will stoop to trivial criticisms of members and speeches.

Another body, the "council of state," a relic of the days of Napoleon, performs the function of advising the president and ministers on matters of public importance. The members are, in many cases, men of learning, and do considerable good in preparing rules for administration, though, as far as legislation is concerned, they are of little avail, for they are not generally consulted.

Since the cabinet is dependent upon the chamber for support, it must naturally deal out favors to the deputies. These are largely in the shape of offices for friends and political aids. Public opinion is largely felt in France, and to avoid censure of the press, it is a well-known fact that the great sums of money at the hands of the cabinet for secret service are largely spent in subsidizing the newspapers.

The System of Courts

starts with the usual local justices of the peace, ascending through courts of appeal to a final supreme court. The president of the republic appoints the judges, with the aid of the minister of justice, and with the exception of the justices of the peace the tenure of office is permanent. A special court also exists, composed of judicial officers and men of administrative training, whose duty it is to decide disputes arising over administrative questions or between officers of the administration and citizens. The methods of procedure in French courts are entirely different from those in America or England, and while there is not so much chance for a guilty criminal to avoid

sentence, at the same time, the system lacks the security of personal liberty. One judge in secret does the work of examining cases instead of a grand jury, and he may dismiss the case or commit it to trial at his own discretion. Many courts which sentence but for three or four years consist of three judges who act without a jury. A prisoner may be kept for days without communication with his friends, and if the judge so wills it, all the evil effects of the old "lettres de cachet" of the days of the Bastile can be reproduced. In the higher courts twelve jurors generally assist the judges and decide by a simple majority. In commercial cases there are special courts and councils made up of experts.

In Local Government

each district has a prefect, or sort of governor, appointed by the president for an indefinite term and responsible to the cabinet. A general council of the department, elected by general vote for six years, one from each canton, assists him. These carry on the general work of the department, such as management of schools, local courts, railroads, asylums and the poor. Likewise the district (arrondissement), the next smaller division, has a sub-prefect appointed by the prefect, responsible to him and really acting as his agent. A council, one member elected from each canton, has the work of dividing the taxes among the communes. The canton is simply a small election district and judicial district for justices of the peace, muster district for the army, etc. The commune (still smaller) is self-governing, and is the unit of all government. Each elects a municipal council according to its population, and this council elects its mayor. The mayor, however, when once elected, becomes the agent of the central government at Paris, and may be suspended or removed if so desired. By the system of appointments and removals from office the government can for a time be absolutely despotic in its decrees, though when this happens new elections shortly remove the real offenders. Thus we have really two extremes of government, yet the great centralized power is plainly shown for the good in the great roads, bridges, expositions, public improvements and educational institutions of France.

GERMANY.

After the ravages of Napoleon upon the German states, their rulers naturally sought a defensive alliance. Till after the war of 1866 Austria was the natural leader of the union, but at that time Prussia came forward and Austria was thrust out. Three forces set to work to bring about what is now the German Empire, namely: first, the necessity of union of the several states; second, the great Bismarck of victorious Prussia, wishing order more than freedom; and, third, the princes of the different states, desiring to perpetuate their thrones, and wishing a degree of states' rights.

History.

After the victories of the Prussian army against the French, the king of Prussia was elected the president of the union with the title of "emperor," and the first coronation—that of Emperor William—took place in the palace of Louis XVI. at Versailles, near Paris, which was still besieged, January 18, 1871.

Shortly afterward a diet was called and the new constitution was drawn up. This has not distinctly marked in it the three-sided form of government so familiar to Americans.

The Imperial Government

consists of the emperor and his administration, a federal council (or bundesrath)

BRIDGE ACROSS THE RIVER ARNO AT FLORENCE, ITALY

COLOSSEUM, ROME

similar to our senate, and a diet (or reichstag) similar to our house of representatives. The latter is composed of 397 members elected by popular vote for five years. Any German twenty-five years old can vote or be a candidate. The members are not paid, but receive free transportation. Bills cannot be introduced in the diet without support of at least fifteen members, and when a bill concerns only a certain state, either in the federal council or in the diet, the whole house does not vote, but rather only that portion affected by the bill. The diet must be consulted on war, the senate on treaties, and neither house can adjourn for more than from day to day, the emperor having the right to fix the dates of adjournment. He is also empowered to dissolve the diet and order a new election within sixty days. The federal council is almost a counterpart of our senate, being composed of ambassadors from the different states of the union, selected by the head of the state, aided in a measure by the legislature. They vote according to the number from their respective states, and votes are cast in a lump by one spokesman for each state. The council is a perpetual body, and the emperor must convoke it upon the request of one-third of the members. The imperial chancellor presides over the council, and in case of a tie, his vote produces the necessary majority for legislation. The council must concur in the legislation of the diet before it becomes a law, and accepts or rejects treaties. In case a state of the union shall not obey commands, the council may enforce its edicts with arms. The council is also empowered by the constitution to execute laws whenever no other provision has been made by law, thus giving, it is said, the actual sovereignty of the empire to this body.

The Emperor

at first glance would be thought to have no more power than that of our president, but it must be remembered that the constitution makes the ruler of Prussia its emperor. The Prussian crown descends to the oldest male, hence a man is always in power. This allows customs to grow up, and privileges are granted the ruler that would never be the case if a president governed, or if the emperor came from a different state each time. Also the German people have a great respect for the glory and grandeur of the imperial throne; the emperor represents the empire in all its foreign affairs, appoints ambassadors without confirmation, and receives those of other courts. Besides this, he is almost absolute lord over an army of 500,000 thoroughly trained soldiers, always ready for the field. As king of the Prussians, he controls their seventeen delegates in the federal council, and it would mean almost revolution if he could not secure the other fourteen votes necessary for a majority. And then Prussia has absolute veto power on questions relating to the army, the navy, and the imperial taxes. This gives the emperor power enough to whip any faction into line.

Bills

are generally prepared by experts and submitted first to the council, and if passed here sent through the chancellor to the diet. Amendments of the constitution are not referred to the people, but are enacted by the council. If fourteen votes are cast against such a measure it cannot pass; hence, it can be seen that no group of smaller states can force on Prussia, with her seventeen votes, a distasteful amendment, and yet neither can Prussia so work against the smaller states that they cannot secure fourteen votes to quash measures harmful to them.

The Chancellor

is the emperor's right-hand man, appointed by him and removed at pleasure. He generally controls politics, is head of the Prussian delegation in the council, and presides over that body. All acts must be signed by him before they become law. Bismarck was the greatest of the chancellors.

Local laws of the different kingdoms of the empire govern mostly in the courts. There is the usual system of local, district and superior courts in the various kingdoms, the judges being appointed instead of elected. From the superior courts appeal is had to the imperial supreme court, which consists of eighteen judges who sit for life and are appointed by the emperor. The empire has a code of criminal law, another for commercial, and recently a civil code that governs the judiciary of all the kingdoms. The powers of the supreme court do not reach to declaring acts unconstitutional, for there is no distinction between constitution and statute. In fact, the judiciary of Germany is only a branch of her political administration.

The nature of the empire, while

Not Strictly Democratic,

is yet as much as can be expected of monarchical states, and very well fits the people it governs. It is no loose confederation, but a firm pact,—an "indissoluble union of indestructible states." Its laws take precedence over those of its states, and a revolting state would be brought to terms by arms. The taxing power is limited to customs and excises on salt, tobacco, beer, brandy, beet sugar and sirup. Pro rata contributions can be called for from the kingdoms to meet emergencies. The empire controls the coinage, railways and telegraph, though the states are allowed to operate mints, and to some extent own railways.

The main defect of this government is that it has no bill of rights in its constitution that guarantees to the individual certain rights against the encroachments of the government when in the hands of unscrupulous agents.

GREAT BRITAIN.

The government of Great Britain is that of a limited monarchy in name only, for, though the oldest member of the reigning family holds the crown and title, as well as the honors of a monarch, yet the power is so limited that were the ruler to attempt to coerce the representative branches of the government, revolution would result in dethronement. The government is that of a cabinet under constitutional control as worked out by a house of commons and house of lords, influenced to some extent by the King and to a great extent by public opinion. Unlike the constitution of the United States, that of England is unwritten, being a mass of customs of gradual growth which it has taken years to be brought out from public acts of the parliament against the reigning sovereign.

In Early Times

in England the power of the monarch was nearly absolute, but gradually, by hard fights, the people gained rights in representation in parliament, some monarchs were deposed, others executed, and still others judged insane or incompetent and regents were appointed. The house of commons deposed Charles I., appointed Cromwell president of the Commonwealth, and later called a monarch back to the throne. James II. attempted later to enforce edicts distasteful to parliament and was deposed, to be succeeded by William and Anne. Since these rulers a cabinet has always played an important part in English government. When

George I. came to the crown he did not understand English, and necessarily leaned a great deal upon his cabinet. Later, George III. tried to do away with this institution, but he eventually had to come around to its use again. Since that time

The Cabinet

has grown into a permanent branch of the government, though not mentioned legally as such, it being simply a growth by custom for convenience' sake.

This cabinet is of from fifteen to twenty of the chief ministers of the various departments or portfolios of the government. A state of affairs that brings about two political parties is necessary for such a form of government, for each party must strive for supremacy, and criticise the acts of the other. The ministers naturally have control of the parliament so as to influence the passage of important measures, or they are of no power and have to resign. When a great issue is at stake, the party that is defeated must of necessity resign the ministry and with it the cabinet positions, for without support of parliament a dead-lock would result. The alternative is had of dissolving the house of commons and appealing by elections to the spirit of the public. If members in sympathy with the measure at stake are returned to the house, the administration is vindicated and the bill is passed, for if the house of lords refuses to agree in the legislation, which by law is necessary, the house, with the queen, can create more new peers to take seats in the house of lords, and thus effect a passage. It is to be seen, therefore, that

The House of Commons

is the direct representative and servant of the public, that it is superior in power to the lords when really supported by the people at large, and that the reigning sovereign must to a great measure coincide with the wishes of the government of the house of commons in order to avoid a revolution. If, then, the commons is so powerful and the direct agent of the people, what is the office of the cabinet, and why is the government at all a monarchy? First, the cabinet is not recognized as such by law. As said before, it was of gradual growth, a secret body of advisers to the sovereign. The party having control of the parliament, and hence most directly representing the people, is the one that the sovereign must consult in order to have any legislation passed. Therefore, when one ministry and cabinet has resigned through lack of support in parliament, the queen calls to her aid the leaders of the victorious party in both houses, appoints them to the offices in the ministry (the privy council), and from the officers of the ministry selects the cabinet that is to originate and influence legislation and administrative acts. Having no standing according to law, the cabinet may act not as the cabinet but as the privy council. The head of the cabinet is the premier, but neither is he recognized by law; he is generally the minister of foreign affairs.

As to the second point,

The Government is Monarchical

because the queen, though not having veto power, yet exerts a powerful check on the cabinet, lords and commons, and though the people are largely democratic, yet they have a great respect for their sovereign, and would not return to parliament members that would willfully set at naught her rule.

The method of administration and legislation, then, is that the cabinet of leaders of a certain party, backed by an influential force in the commons and lords, in secret session discusses and

frames plans of action. The advice and consent of the sovereign is gained, and the measure sent through both houses of parliament. If the houses concur, it is legal; if they disagree, the cabinet (as privy council) and queen may dissolve the commons and trust to an election to vindicate their ideas; or the cabinet may resign their positions in the ministry, whereupon a new ministry and cabinet is formed from leaders of the victorious party. Altogether, the system of checks and balances is admirable, the main feature being that though the queen can do no wrong, her ministers, as guided by her, can, and they are directly responsible for bad management, being forced to resign at the lack of public approval.

Since the

Constitution is Not Written

the courts do not sit upon the constitutionality of an act; the parliament is all powerful, and any legislation passed by it is presumably constitutional. Thus, if the judiciary, which is entirely separate from the legislative and executive branches, though appointive in some degree, should judge laws contrary to the opinions and wishes of parliament, acts would be passed that would nullify the old laws. The judiciary holds office for life, and cannot be removed except for cause. This gives a great degree of liberty to their acts, and tends toward justice in the main. The

House of Lords

has power almost collateral with that of the house in making legislation, except that it cannot introduce or amend money bills. The privy council, which is the legal body of the ministers in session, does the official negotiating with the queen and signs acts. Altogether, there are five sources of influence that bring about English government: First, the queen legally and formally appoints; second, the cabinet cannot continue to exist unless it has the support of a majority of parliament—thus the commons is said to choose the cabinet; third, when a new house is elected, the voters determine who shall be next prime minister, for the leader of each particular party is in mind when the ballot for members is cast; fourth, parties must exist to keep the system of cabinet up—that is, one party must always be ready to take the place of the one in power, thus making all acts open in the light of publicity; and, lastly, the man himself must develop into a leader in order to give a possibility for cabinet rule over the sovereign and lords.

RUSSIA.

Autocracy, or government imposed upon a people rather than created by them, is the principle upon which Russia is ruled. And yet in the home life of the Russian villagers democracy is pre-eminent. Thus the worst and the best form of governments occur in the same land, at opposite ends. The land of Russia is one-seventh of that of the whole globe, covers the cold sides of both Europe and Asia, and is inhabited by about 130,000,000 people. Three-fourths of this nation are people of the Slavic race,—people who for centuries have threatened the southern countries of Europe, and who, it is feared, will one day dominate the earth. They are admirably adapted to colonizing, and when in their early history robber chiefs arose who oppressed them, they simply moved to another quarter of their country where, in their "mir" or village, they could have some degree of freedom in the ownership of land. They did not dread slavery, but while being owned bodily, they still persevered in the customs of the "mir."

History.

When all the rest of Europe was being freed from the feudal system by the uprising of commoners, Russian nobles were just beginning to see the richness of the prize that lay before them in the shape of innocent villagers who knew not the terrors of robbery or slavery. At once the poorer classes were forced to carry out the will of the noble; law was unknown as the offspring of the people, and commands and edicts took its place.

Peter the Great,

who died in 1725, was the power that first began to bring order out of chaos, and the autocracy that he organized has remained for almost two hundred years to the present time. A great part of his work lay through the church. Russians had long been of the Greek orthodox church. A patriarch existed and the church owned its lands. Peter at once dispensed with the patriarch, confiscated the lands, and appointed a

Holy Synod

to do the bidding of the czar in matters ecclesiastical. Since the church is thus under the direct will of the czar, it must follow that any belief not to his way of thinking must be persecuted and perish. High-mindedness must needs soon dwindle, and instead of exposition of religion and teachings for the goodness of the belief, there is in reality nothing but vast ceremonials and endless doings. Thus, through the church, the czar wields an enormous influence over the minds and souls of the common people.

Three Agents.

Besides the holy synod, the czar has three other methods of executing his will: a committee of ministers, a council of state, and a senate. With these divisions one would suppose some division would be made of legislative, executive, and judicial duties, but such is not the case. That would be an approach to democracy, and we are here dealing with autocracy. All these bodies exert the functions of all branches of government, though each has its particular duties. However, the executive, instead of having a check put upon him by the people or any other branch of the government, is absolute; he issues orders instead of laws. Thus there is no legislative branch, the usual bodies simply aiding in suggestions for the executive and in seeing that they are properly issued. Neither is there such a thing as a branch of justice, for since there are no laws, there must needs be no interpretation of them; simply the enforcement of the commands of the executive. In short, the czar wills, the czar sees that his will is obeyed, and the czar punishes arbitrarily any disobedience.

For convenience' sake there are

Twelve Departments,

such as state, navy, justice, foreign affairs, and the like, and the heads of each, appointed by the czar, form the committee of ministers. Their duties are to aid in conducting the affairs of administration, and issuing explanations of the so-called laws. They may not resign without the consent of the czar, for then he would not be having implicit obedience. The council of state consists of some sixty members appointed by the czar, of which twelve are the ministers of the various bureaus. The duties of the council are principally those of consultation and information. Reports of the departments are read here and discussed and special commissioners appointed by the czar look into the details of recommendations of the ministers. The council also considers the annual budget, or expense account.

The Senate

is the body through which the so-called laws are patched up in shape to dupe the people. It is composed of high dignitaries, also appointed by the czar, and these men have in charge the putting into effect of all commands. Ministers or governors of provinces are also here called to account for their conduct. The senate is regarded as the last court of resort in the feeble judicial system, though the council of state may review its acts.

Thus, there are four main agencies for the execution of the will of the imperious czar: the holy synod, for church matters; and for matters of state, through twelve departments or bureaus and the committee of ministers, the council of state, and the senate. All sorts of work are done in all bodies, and the sole object aimed at is the union of every phase of government into the single person of the czar.

Yet, while this autocratic method is pursued with cruelness over the great needs of the state, in the family life democracy is triumphant. Entire freedom of will is expressed in the

Government of the Town Meetings

by the heads of families, custom having gone so far that decisions must be unanimous to be effective. The "mir," or town, is all-powerful in all matters that pertain directly to its domestic life; its officers are responsible to the people at large, and it is no branch of the rule of the czar. All the czar wishes is obedience to laws, especially in the matters of taxation. Here the "mir" is willing to submit; the people are simply victims of the higher government, but complain little if let alone in their home life and ownership of land.

It is not to be wondered at that such a government by one powerful and possibly unscrupulous man should cause uprisings and plots. In fact, the government uses such methods, and the people copy after them. It is said that assassination is a frequent method of meting out so-called justice to the czar's subjects. After a time such a rule must needs dwarf the sensibilities of the people, and then worse punishments must be prescribed to arouse dread.

Flogging

and exile to the mines in Siberia are of daily occurrence. Without warning, the government lays hold on those who have broken no law, and subjects them to the severest penalties. What wonder, then, if the government that uses the sword in the place of law must in the law of nature sometime perish by the sword?

THE UNITED STATES OF AMERICA.

It is a common and erroneous saying that the constitution of the United States is the most marvelous instrument ever struck off by the brain of man. This would lead people to think that our forefathers simply sat down to the task of writing a constitution, and produced a paper at first thought that has since proved almost perfect. Such was not the case. For generations before, both the colonists in America and their British cousins across the water had been fighting the domineering power of the English crown, and as a result many concessions were made to the

Representatives of the People.

Though we were oppressed by governors not our own, and by foreign-made laws, yet we had in every colony some form of democratic government as expressed in the councils and assemblies. In most cases there had been grants or charters, given by the sovereign, enumerating certain privileges. These were in reality little constitutions. All the colonies

were in the habit of sending complaints to England, sometimes even rebelling if the governors did not acknowledge the proper powers of the people. What wonder, then, that upon throwing off the English yoke the different colonies should at once frame constitutions democratic in nature, somewhat improving upon their old forms, and later that the colonies upon uniting into the common union should combine all their various forms into one instrument? Many clauses in

Our Present Constitution

were deemed decidedly undemocratic by some of the colonies, and vice versa. Thus the great central system of our government is built about an instrument that was in every sense the outcome of simple experience, and one of compromises and concessions.

In 1787 a body of men framed this constitution, and referred it to the various colonies for ratification. The instrument stipulated that upon the adoption by nine colonies it was to be effective, and was to be permanent. In 1788 nine colonies had signed, and in 1789 George Washington was installed as the first president, with the capital at New York. The government thus laid down in writing, and which by common consent is supreme, consists of three main departments: legislative, executive, and judicial. The first comprises two representative bodies: the senate, or upper house, consisting of two members from each state elected for six years each and so divided that one-third of the house is new every two years; and the house of representatives, consisting of members from each state in number according to the population, and each elected for two years. The senators are chosen generally by the legislatures of the states, and if a vacancy occurs during vacation, the governor of the state temporarily fills the vacancy. The representatives are elected directly by the people of the congressional districts of each state. These two houses are almost co-ordinate in their powers, though only the representatives can introduce money bills, and only the senate can ratify treaties with the president, and agree to appointments made by him.

L. of C.

The President of the United States

is the main executive, elected by an electoral college, and serves for four years with the privilege of re-election. The electoral college consists of members chosen from each state, equaling in number the representatives and senators of that state. These electors are chosen at large by the people of the state, and at the capital of their state on a day appointed by law they cast their votes for president and vice-president. The votes thus cast are forwarded to Washington, where they are all counted together and the decision made as to the man elected. All the electors of one party in any state may be elected by a bare majority, especially if election districts are so marked out as to favor that party. Thus, while the popular vote of the whole country might favor a president of one party, the system of electors may result in placing a man in the chair who has the less number of votes of the people behind him, as when Harrison was elected over Cleveland in 1889. As far as law is concerned, the elector is not bound to vote for any particular candidate, but custom has arisen by which they pledge their votes for the leader of their respective parties.

The Duties of the President

are to see that the laws of the land are duly carried out, to send a message to each congress suggesting needed legislation, and to sign or reject bills for legisla-

tion. He has the veto power, but the two houses of congress may pass a bill over his veto by a two-thirds vote. He is commander-in-chief of the land and naval forces of the United States, is the official representative of this country in dealings with foreign powers, and is the general adviser for the welfare of the government. Assisting, though not called for by the constitution, are a number of officers who head the different departments of state, navy, war, interior, treasury, etc., and who together form his cabinet. With these men, who, by the way, are selected by him with the consent of the senate from the greatest men in the country, he consults on matters of administration. They are directly responsible to him for their acts, and censure would lead to resignation, though not necessarily without the demand of the senate. Each of the department heads sees that the work in his particular province is carried on; for instance, the postmaster-general controls in a great measure the post-offices all over the country.

When

Legislation

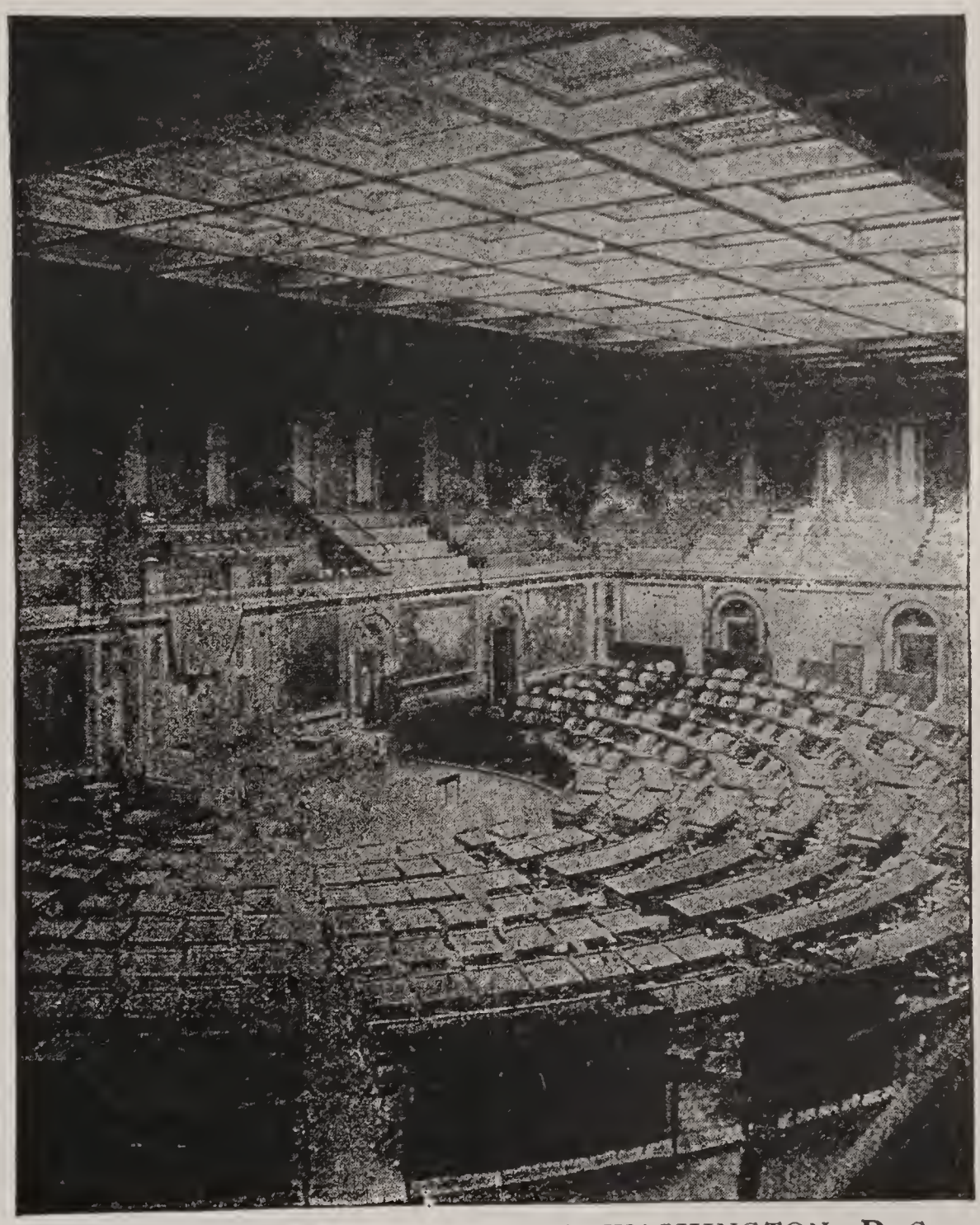
is proposed in one of the houses it is sent over to the other for confirmation. Here it is either refused or passed. In the latter case it goes to the president for his approval. If he signs it, it is at once a law; or if he allows it to remain unsigned ten days there is the same effect. As before said, he has the veto power, but he cannot block legislation that has the support of two-thirds of congress. The senate is the more conservative of the two houses, for it represents not the people directly, but rather the individual states of the Union. Here are brought to naught many of the bills from the house of representatives that are considered too radical. The legislation in the house of representatives is carried on largely by committees. A speaker elected by the house appoints a number of standing committees for various subjects to be considered. When a bill is presented, it is at once referred to a committee, which refers it to a sub-committee. If the bill is in favor with the party in power the committee reports favorably, and a vote is cast. But if otherwise, the committee never lets it see the light of day again. Thus it may be seen what a power resides in the speaker.

The Judicial Department

consists of a supreme court and various lower courts, entirely independent of the other two departments, though generally somewhat in sympathy with them. The federal courts, which are courts of the United States as a whole, in distinction from those of state power, pertain only to the laws of congress and the constitution, with the exception of the supreme court, which is the court of last resort for any legal question, be it of state or federal law. To understand just the distinction between the federal and state powers one must know that in their local governments the states are absolutely supreme, that is, of course, where they do not come into contact or conflict with the powers given by the constitution to the federal government. The federal authorities govern only such questions as interest the whole union of states. The minor matters of the states, such as police, civil and criminal laws, schools, etc., are in the domain of the states alone. These have assemblies consisting of two houses elected by the people, and a governor, for the enactment of state laws and the execution thereof. Whenever the federal government attempts to encroach upon the rights of the states, they at once appeal to the constitution, which is the supreme law of the land. The judiciary decides

what is the proper construction of the constitution, and declares the law valid or void as the case may be. Thus we have a system of checks and balances as good as almost any government. The president cannot act without the aid of the houses, the houses cannot enact legislation, unless by great majorities, without the consent of the president, and after the law is enacted, if it is questioned, the judiciary must also be in accord with the other branches of the government before the law is legal.

The tendency all the while is for the Supreme Court to uphold the acts of congress and the president, for it considers that the congressmen are serious in their intents, and not merely passing laws to hold their positions. This leads the federal government more and more to control the states, and tends toward a centralized government. But if the people do not like this method, they at once resort to the ballot, a new president soon takes the chair, and new senators and representatives govern more in accord with the sentiments of their constituents.



HOUSE OF REPRESENTATIVES, WASHINGTON. D. C.

Colonial Government of the United States.

THE president is giving careful attention to the selection of civil governors for Puerto Rico, Cuba and the Philippines. As commander-in-chief of the army it is within his authority to designate civil governors to act under the direction of the secretary of war.

In administration circles it is not expected that congress will take hasty action concerning Cuba, Puerto Rico or the Philippines. Until congress relieves him the president will remain in supreme control of affairs in the islands, and he is proceeding under the conviction that the welfare of the people will be in his charge at least during the remainder of his present term.

PUERTO RICO.

The problem of civil government in the islands yielded or ceded by Spain presents itself in the simplest form in the case of Puerto Rico. That island is fully and without question under the sovereignty of the United States. It came to us not only by legal right, but with the cheerful and unanimous desire of its people, who are peaceful and loyal, and eager for the benefits to be derived from the application of American ideas of government.

In determining the question as to the form of government and the participation of the people of the island therein, the most important fact to be considered is that the people have not yet been educated in the art of self-government or any really honest government. The difficulty does not consist merely of a lack of familiarity with the methods and processes of government; it lies deeper than that, in the fact that the Puerto Ricans as a people, have never learned the fundamental and essential lesson of obedience to the decision of the majority. In the experiments which have already been tried in municipal elections and toward government by municipal boards, the minority which is voted down almost invariably refuses to participate further in the business of government.

The attitude of the defeated party is precisely that which causes the continual revolutions in the government of other West Indian islands and the Central American states in the same latitude. It would be of no use to present to the people of Puerto Rico now a written constitution or frame of laws, however perfect, and tell them to live under it. They would inevitably fall unless they had a course of tuition under a strong and guiding hand. With that tuition for a time their natural capacity will, it is hoped, make them a self-governing people.

Plan of Government.

Some such provision should be made for future government as the following

That we should first declare definitely, by statute, what general laws of the United States are to be extended to the Puerto Ricans, such as, for instance, the postal laws, the banking laws, the customs, navigation and internal-revenue laws with such modifications as may be deemed advisable, the laws against counterfeiting, the anti-trust laws, etc., and provide for federal officers to execute these laws just as they are executed in the various states and territories of the Union. That there should be a provision for a federal judiciary in the island, with the same kind of jurisdiction which is exercised by the circuit and district courts of the United States, and that jurisdiction to review their determinations should be vested in the Supreme Court of the United States, or in a designated circuit court of appeals and the Supreme Court of the United States. That there should be a form of local insular government provided which shall have complete control over the rights, property and obligations of the people of the island, substantially covering the field covered by the government of our respective states, and subject to limitations prescribed by congress of the same character as the constitutional limitations generally imposed upon our state legislatures.

Framework of the Plan.

The framework of this government should be substantially as follows: A governor, to be appointed by the president of the United States, with the advice and consent of the senate; the chief officers of state customary under our system, such as secretary of state, attorney-general, treasurer, auditor or comptroller, superintendent of public works, and superintendent of education, to be appointed in like manner, and a legislative council, to be composed of the chief officers of state and a minority selected from the people of the island by the president. That all acts of the council should be subject to the veto power of the governor and to be passed over the veto by a two-thirds vote, and no law should take effect until it has remained without disapproval for thirty days after presentation to congress, or to the president of the United States if passed when congress in not in session. That there should be a supreme court of the island, composed of judges appointed by the president with the advice and consent of the senate, and having appellate jurisdiction only; trial courts in separate districts, having general original jurisdiction, with judges and officers to be appointed by the governor, and a petty court in each municipality; that the several municipalities now existing in the island, with such consolidations and alterations of boundaries as the council shall prescribe, shall be governed by mayors and municipal councils, to be elected by the people of the municipalities, each municipality to be free from control in the exercise of the powers of local government, except as it shall be controlled by statute, and except as its officers shall be liable to removal by the governor in case of failure to faithfully perform their duties, and with power in the governor, in case of such failure, to order a new election and to fill vacancies in the meantime.

Legislature.

The question whether there might not now be provision made for a legislature elected by the people of the island is not free from doubt, but in view of their present inexperience it would be better to postpone such a provision until the people can have had an opportunity for exercise in municipal government, and until the first formative period of adapting the laws and procedure of the island to the new

conditions shall have passed under the direction of a council composed of Puerto Ricans selected for their known capacity and wisdom, and Americans from the states competent and experienced in dealing with legislative and administrative problems. The constitution of such a legislature should be contemplated as a step to be taken in the future.

Wherever it is necessary to employ Americans, except in the chief offices, a system of civil-service examination should be provided, under which requests from the governor of Puerto Rico for persons to be appointed may be filled.

The answer to the question, "What shall be the treatment of the municipal law of the island, and how far shall the laws which now regulate the rights and conduct of the people be changed to conform to ideas which prevail among the people of the United States?" presents little real difficulty. The civil code established by Spain for Cuba, Puerto Rico and the Philippines, and in force at the time of the cession, is an excellent body of laws, adequate in the main and adapted to the customs and conditions of the people. It should be continued in force with such gradual modification as experience from time to time suggests to those who are actually engaged in enforcing it.

Congress has the legal right to regulate the customs duties between the United States and Puerto Rico as it pleases; but the highest considerations of justice and good faith demand that we should not disappoint the confident expectation of sharing in our prosperity with which the people of Puerto Rico so gladly transferred their allegiance to the United States, and that we should treat the interests of this people as our own.

CUBA.

Definite steps were taken in the course of the first six months of the year 1901, by the Congress of the United States and by the Constitutional Convention of Cuba, to determine the future relations of the two countries. The so-called Platt amendment to the army appropriation bill was adopted by the United States Senate, February 27, by a vote of 43 yeas to 20 nays and agreed to by the House March 1 by a vote of 159 yeas to 134 nays.

The Cuban convention was at first strongly opposed to accepting the conditions laid down by the amendment and sought to have them modified in several material respects, but finally, on the 12th of June, by a vote of 16 to 11, agreed to them without qualifications of any sort. This result was brought about by the report of a commission which had been appointed by the convention and sent to Washington in April to confer with the President on the relations of Cuba and the United States. Briefly, the Platt resolutions provide:

Terms of the Bill.

1. That Cuba shall not enter into any treaty or other compact with any foreign power which will impair the independence of Cuba and shall not permit any foreign power to obtain lodgment on the island in any manner.

2. That Cuba shall not incur a public debt beyond the ordinary revenues of the island.

3. That the United States may intervene to preserve Cuban independence and protect life, property and individual liberty.

4. That all the acts of the United

States during the military occupancy of the island shall be ratified.

5. That sanitary plans to prevent the recurrence of epidemics shall be carried out.

6. That the Isle of Pines shall be omitted from the Cuban territory, the title thereto being left for future adjustment.

7. That the United States shall be permitted to buy or lease lands for naval or coaling stations on the island at points to be agreed upon.

8. That these provisions shall be embodied in a permanent treaty with the United States.

CONSTITUTION.—On the 21st of February the Constitution as adopted by the convention was signed by the members of that body. The instrument is in the main like that of the United States. It provides for a republic of six states, coinciding with the six old provinces of Havana, Matanzas, Pinar del Rio, Puerto Principe, Santa Clara and Santiago.

The election law occupied the time of the convention until September and had just been completed when President McKinley died. It provided for a general election December 31, 1901, at which representatives in Congress, provincial councilors and governors and members of an electoral college are to be chosen by direct vote. The electoral college will meet February 21, 1902, to choose a president and vice-president of the republic and members of the senate, of whom there are to be six from each province.

First President.

The most prominent candidate for the presidency at the close of the year was Estrada Palma, who represented Cuba in the United States at the time of the revolution. He was afterward elected, as elsewhere stated. The convention having completed the work for which it was summoned was formally dissolved by Governor-General Wood October 3.

AREA AND POPULATION.—The total area of Cuba is 35,994 square miles. The population in 1899, when the last census was taken, was 1,572,797, distributed among the six provinces as follows:

Havana	424,804	Puerto Principe	88,234
Matanzas	202,444	Santa Clara	356,536
Pinar del Rio	173,064	Santiago	327,715

Population of principal cities:

Hanava	235,981	Matanzas	36,374
Santiago	43,090	Puerto Principe	25,102
Cienfuegos	30,338	Cardenas	21,940

About 67 per cent. of the population is white.

EDUCATION.—The public schools of Cuba have been under the direct charge of Lieutenant Matthew E. Hanna since 1899, and are rapidly growing in number and efficiency. At the close of the war public education was at a standstill; at the close of 1900 there were in the island 3567 school-rooms and the same number of teachers, with a total enrollment of 172,273 pupils.

Teachers, schools and pupils were distributed among the provinces as follows:

Provinces.	*Teachers.*	*Schools.*	*Pupils.*
Havana	904	904	41,383
Puerto Principe	246	246	9,355
Santa Clara	879	879	44,872
Santiago de Cuba	645	645	33,983
Pinar del Rio	274	274	13,282
Matanzas	619	619	29.398
Grand total	3,567	3,567	172,273

The averge salary per month paid to men teachers is $49.91 and to women $47.73.

Since the Spanish evacuation there have been no strictly military operations, and the officers of the army in Cuba were largely occupied in conducting, under the direction of the military governor and the department commanders, a general civil

administration, for which no other governmental machinery existed, and in aiding the existing municipal governments in the performance of their duties.

For the present there is no disposition on the part of the United States to annex the island. The promises made at the outbreak of the war with Spain will be literally fulfilled. Cuba will be free, and a party in favor of annexation will be formed in the United States favorable to the admission of the island to the Union.

THE PHILIPPINES

Claim to government by insurgents in the Philippines can be made no longer under any fiction. Its treasurer, secretary of the interior, and president of congress are in our hands; its president and remaining cabinet officers in hiding, evidently in different central Luzon provinces; its generals and troops in small bands scattered through these provinces, acting as banditti, or dispersed, playing the role of "amigos," with arms concealed.

Since that time our troops have been actively pursuing the flying and scattered bands of insurgents, further dispersing them, making many prisoners, and releasing many Spanish prisoners who had been in the insurgents' hands.

It is gratifying to know that as our troops got away from the immediate vicinity of Manila they found the natives of the country exceedingly friendly, and both men and animals were able to live upon the country and for considerable periods leave their supply trains behind.

Wherever the

Permanent Occupation

of our troops has extended in the Philippine Islands, civil law has been immediately put in force. The courts have been organized, and the most learned and competent native lawyers have been appointed to preside over them. A system of education has been introduced and numerous schools have been established. It is believed that in the city of Manila a greater number of good schools, affording better facilities for primary instruction, exists to-day than at any previous time in the history of the city.

The commissioners appointed by the president to study the government of the Philippines returned, and congress proceeded at once to take action upon the question of replacing the military with a civil government.

THE HAWAIIAN ISLANDS

For a considerable time after the queen of the Hawaiian Islands had been deposed from her throne the liberal party in the islands, made up largely of Americans and Europeans, repeatedly petitioned the government of the United States for annexation. Early in 1898 the provisional government sent to this country a commission to bring about the desired junction of the two governments. Debate was hot in congress for some time, and several treaties were drawn up and pending. Upon the explosion of the Maine in the harbor of Havana, however, the administration was so aroused that as a war measure it was decided to annex the islands. Accordingly, June 11, 1898, the house passed a resolution by a vote of 209 to 91 to take

Possession of the Islands

ceded by the provisional government, the senate concurring July 6, by a vote of 42 to 21. August 12, this government officially lowered the old Hawaiian flag and set our own stars and stripes over the government buildings, and administered the oath of allegiance to the national

guard. The resolution under which the islands were annexed stipulates that "until congress shall provide for the government of such islands, all the civil and judicial and military powers exercised by the officers of the existing government in said island shall be vested in such person or persons and shall be exercised in such manner as the president of the United States shall direct." The existing treaties with foreign powers were to cease, and be replaced by those of the United States; municipal legislation not inconsistent with the resolution or with the constitution of the United States was to remain in force until congress acts; customs duties were to remain in full force; the public debt was to be assumed by the United States, not, however, to a sum greater than $4,000,000. The Chinese were at once barred from further immigration.

A Joint Commission

was to be appointed by the president to study the laws and customs of the islands, and report to the congress of the United States for legislation. For this purpose $100,000 was appropriated by our government, and President McKinley appointed Senator Cullom of Illinois, John T. Morgan of Alabama, Representative Robert H. Hitt of Illinois, Ex-President Dole of Hawaii, and W. F. Frear of Hawaii, as the joint commission. This commission studied the nature of the islands, and from their reports congress proceeded to enact measures for governing our new possessions.

STREET SCENE IN HAVANA

TRAVELING IN THE AIR

MODERN SCIENTIFIC KITES AND FLYING MACHINES.

Wonderful development toward solving the problem of Aerial Navigation. Travel through space at enormous speed assured in the near future.

SCIENTISTS and mechanical engineers are looking for some one to bring to perfection a pactical flying machine or air ship. They no longer laugh at the idea that earial flight is a possibility, but instead say that it is not only a possibility but a strong probability. The reason for this is that a number of men have been steadily experimenting for the last decade upon kites, aeroplanes and balloons, with the idea in view of being able sometime to direct them at will. Otto Lilienthal, a German inventor, came as near, perhaps, to perfection as any one yet, while Maxim, the gun inventor, has been to some extent successful. The latter built a machine eight feet wide and forty feet long, which by propulsion by screws made a number of flights.

Lilienthal's Method

not only was successful in propelling to some distance a machine through the air, but also carried its inventor. His outfit consisted of several large "planes" made of light wooden frames covered with cotton cloth, the whole apparatus much like four outspread wings of a huge bird. They were in two sets, one above the other, connected by vertical rods, and at the back between the two extended a large, cloth-covered rudder, which also had horizontal planes. The operator held on to the lower set, clasping levers to the wings by his hands, while at the same time he was supported by cushions under his arms, thus leaving his legs free and dangling in the air. The affair weighed from thirty-five to fifty-five pounds, and was intended for jumping from a high tower, somewhat after the style of a parachute, only as the flyer started off into space he might work the levers, which in turn manipulated the planes, and sent him shooting out at an angle, or soaring up again or around in circles, just like a bird.

Near Berlin, Lilienthal built a tower about fifty feet high on a hill, and from this he sailed as far as six hundred feet in easy winds, sometimes against heavy winds, and on several occasions he reached a height greater than that from which he started. These experiments, though they advanced the science of aeronautics, at last resulted in the inventor's death by collapse of his machine.

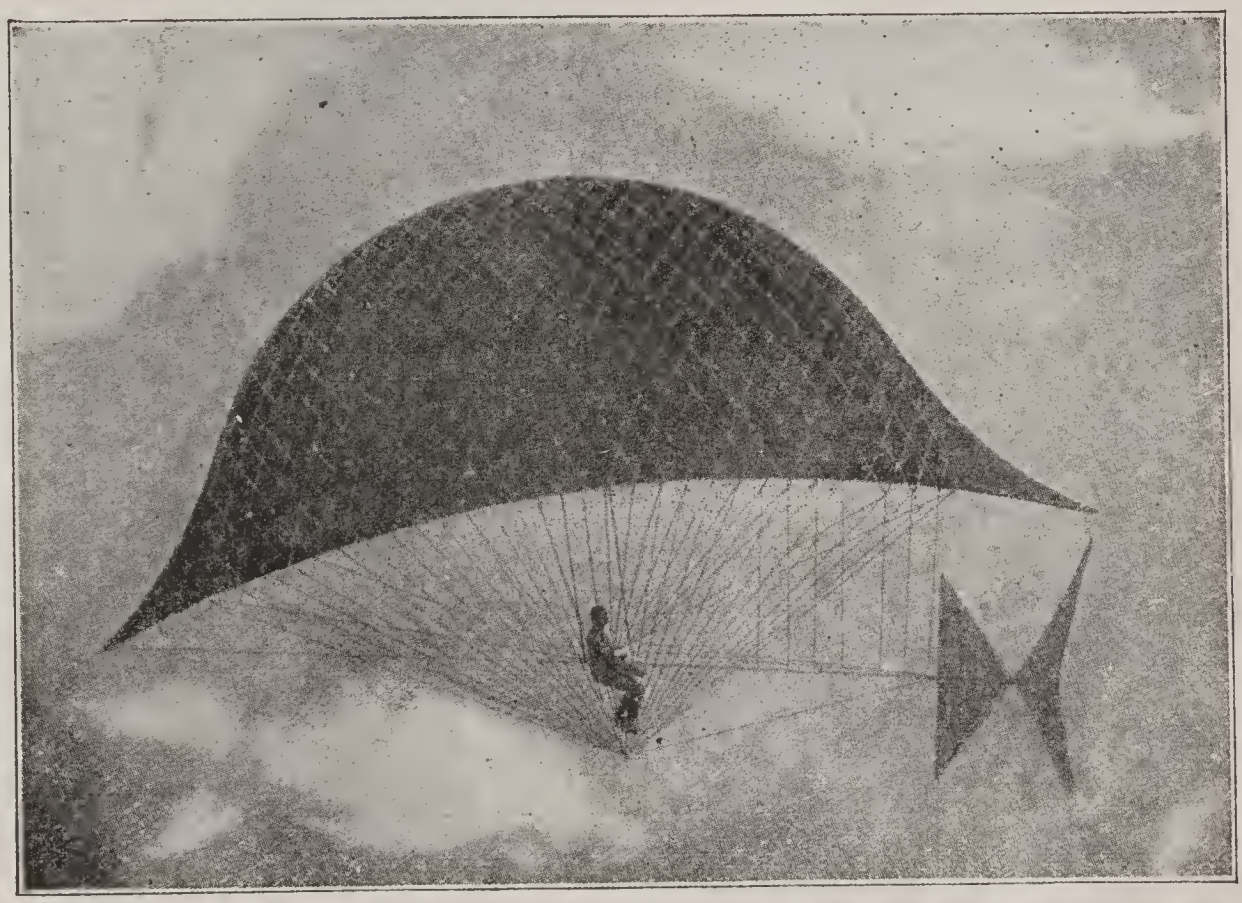
Professors Chanute and William Paul

some years ago conducted a series of aeroplane flights at Dunne Park, Indiana, on the shores of Lake Michigan, which were in the main successful. No motive power was used, the principle being that a slide down hill would lift the plane a distance into the air, and then by other planes and rudders, the machine was kept in the air for some time.

Paul has also invented one of the most perfect tailless kites of late years. It is called

The "Fin" Kite,

and consists of two planes, one intersecting the other at right angles, so that there are presented to the wind four fins, two lateral, one at either side, and two perpendicular, one above and one below. The connecting band is attached at the ends of the perpendicular fins, and when the kite is raised it exerts a very powerful pull, and has hardly any wavering motion. Heavy logs have been pulled across Lake Michigan in tow of the kite, and the inventor contemplates a voyage himself in a small iron open boat.



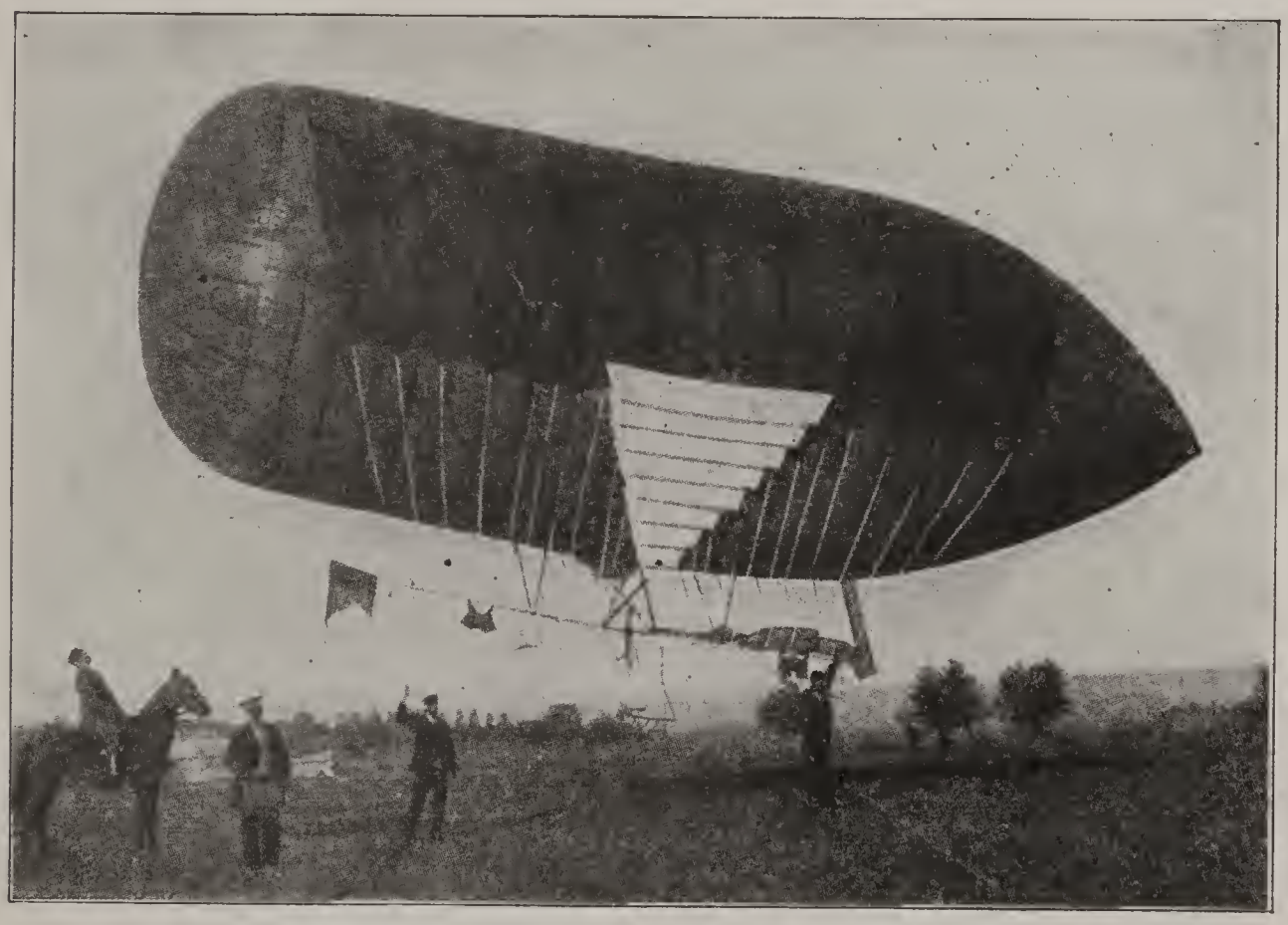
A GAS-KITE BEING PROPELLED THROUGH MID-AIR.

Probably the best experiments, or those that have borne the most useful results, are those made by the war departments of this country and Europe. The use of the kite has been remarkable in past years. Franklin by its aid drew electricity from the clouds; Peacock dragged a little carriage by one, and others have suggested life-saving apparatus with kite connection. But it has really been only in recent years that huge kites have been constructed with the sole purpose of experiment.

The great variance in wind pressure under different conditions makes it rather difficult to figure accurately on flights. Tails for a long time were considered necessary, but of late years this hindrance was done away with. The fact that tails were not necessary was discovered purely by accident. A famous kite-flyer had built a huge affair of 500 square feet with an immense tail of brush. At the first attempt at flight the tail became entangled in a tree. The kite came to ground, and the disgusted maker resolved to try another tail, when a gust of wind came along and took it up in the air, where it flitted about unsteadily, but rather successfully, though without an appendage.

The material for building is varied, sometimes the frames are made of bamboo, sometimes of metal, while the sails are often made from silk or cambric cloth, and sometimes even heavier material. The most successful flyers operate several

kites from one rope, thus giving great lifting power. Captain Baden-Powell, of the Scotts Guards, rigged up a series of five kites and attached a balloon basket to them which would lift two men to the height of 100 feet. Photographic apparatus has been attached to kites and bird's-eye views of the earth taken by manipulating strings from the ground. Pictures of birds in flight have also been made in this way. In large cities flags and advertising banners are flown from the supporting string, and in signal service corps occasionally signals are sent to distant camps by their means.



DANILEWSKY'S DIRIGIBLE FLYING MACHINE.
Showing wings and the bag inflated ready for a flight.

For years,—in fact, ever since the balloon was developed into a man-carrying flyer,—plans have been laid to make it so that it can be propelled and directed at the will of the operator. Huge cigar-shaped bags filled with gas have been floated to which were attached baskets of some sort containing propelling machinery and rudders. The general plans that seem to be followed the most are those which call for large planes or wings so constructed that they will help to support the ship, and also guide it by extending great enough surfaces so that conflicting winds will not beat them about. Screw propellers above and at the rear are generally used to draw the ship about.

The latest improvement in the line of,

War Balloons

comes from Germany. That country took no interest in ballooning till 1884, whereas her traditional enemy, France, began investigations in the science of aeronautics at once after the war of 1870. However, Germany has made rapid strides in her experiments, with the result that the United States government is now buying one of the recent productions of her skill. The balloon in question is the invention of Captain von Parsval, a Bavarian, and First Lieutenant Sigsfeld, a Prussian. Hitherto the wind has been the greatest difficulty to overcome in this science. Even a moderate wind was sufficient to depress the ordinary bullet-shaped ship, the result being that it could not mount high, and was thus practically useless for military purposes. To surmount the wind difficulty, therefore, this ship has been made of great length, and of such nature that it rises in the air on a slant, somewhat like a kite. This odd feature has given the device the name of the "dragon" balloon. The main bag is filled with a buoyant gas which keeps the

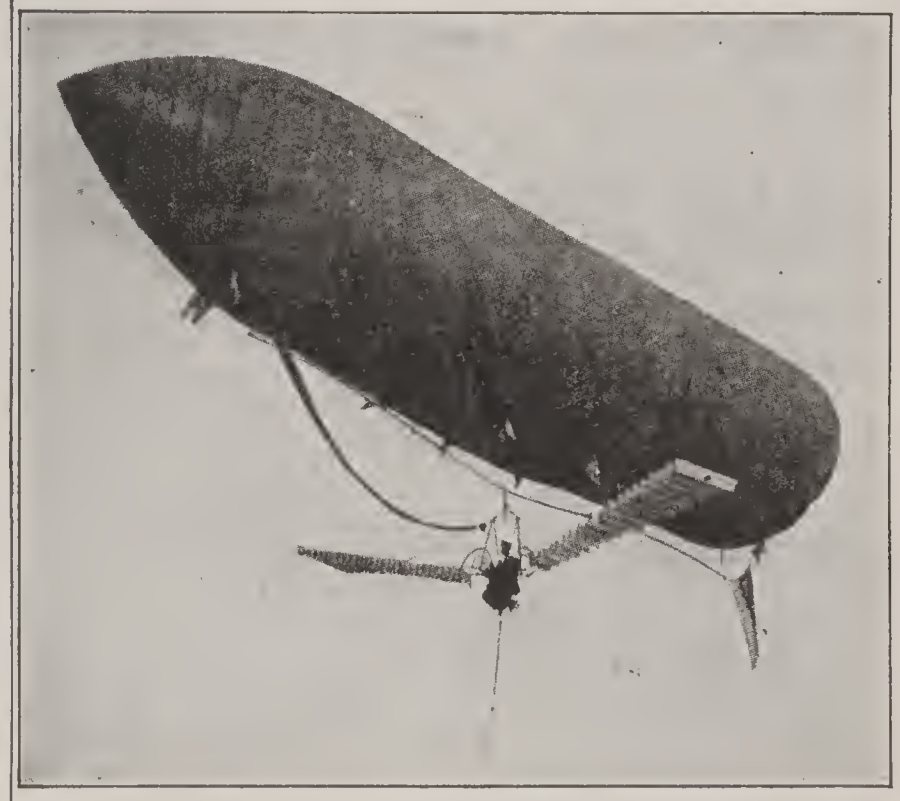
ship afloat, while at the rear and below it is a sack-like arrangement which is open to the wind, allowing it to pass through an aperture in the back, thus steadying in a great measure the balloon against heavy gusts of wind. The basket is hung to the rear end, and from it are run cable and telephone wires, thus weighting that end and keeping the whole ship in the air at an angle of 20 degrees to the horizontal. Ingenious devices are arranged inside the bag for keeping the pressure the same upon the sides at all times, this having been one of the greatest difficulties to overcome. At the sides of the bag are fins which in a great measure protect it from upward wind currents. A cable through which run insulated copper wires for telephone and telegraph communication, holds the balloon to earth and is reeled from a cylinder on a wagon. When the huge ship rises in the air, it can stand steadily in almost any direction desired, and in the face of heavy gales does not fly about. The benefits to accrue from such a contrivance are many; battles may be viewed from a distance; explosives dropped on the enemy, though this is prohibited in civilized warfare; fortifications inspected and photographed, and similar manœuvres.

Use of Liquid Air.

With the help of the motive power of the newly-discovered liquid air we may expect to have some sort of a dirigible airship before long.

Even now this expectation appears to have been fulfilled. Under date of July 13, 1901, the following account was transmitted from Paris:

There is scarcely room for even a shadow of doubt that M. Santos-Dumont has definitely solved the problem of aerial navigation. During a couple of hours yesterday morning he conclusively proved this by steering his new 'aeronef,' the Santos-Dumont, No. 5, through the air in every direction, north, south, east and west, turning to the right or left, wheeling round in wide circles above the Bois de Boulogne, and finally sailing off to the Eiffel Tower, near which a trifling accident to his rudder necessitated a momentary descent.



FLYING.
The wings being raised in mid-air and being propelled by occupant of the ship.

The accident only showed the more unmistakably the practical utility of M. Santos-Dumont's astounding invention. The airship came to earth as easily and lightly as a bird, and when the defective steering rope connected with the rudder had been repaired, it ascended again, made a complete turn upon itself and returned to its starting point, the Parc d'Aerostation, at St. Cloud.

M. Santos-Dumont had kept very secret his intention of making the ascension. It

was impossible to fix a day or hour beforehand, he said to me last evening at the Aero Club, in the Rue du Colisée, an association that does a vast amount of practical and invaluable work to advance ballooning in France.

"Perfect weather," he said, "is desirable for the first experiment. I have slept at the Parc d'Aerostation for the last two nights so that I might be ready to go up at the first favorable moment. Wednesday night was unsettled, and even last night a storm, luckily of brief duration, threatened to make a postponement of the ascension inevitable. However, it quickly blew over and a dead calm set in, so I decided to make the ascent.

Marvellous Achievement.

"My balloon was got out of the shed, and right after three o'clock the trial began.

"It appears," he added, with characteristic modesty, "that it was successful."

If M. Santos-Dumont was content with merely expressing satisfaction with the results of his experimental ascension, M. Emmanuel Aimé, a distinguished professor of sciences and mathematics and secretary of the Aero Club, was wildly enthusiastic.

"It is marvellous!" he exclaimed, again and again. "It is the one practical, really practical, attempt to make a dirigible balloon that has been an unqualified success."

M. Aimé is accepted all the world over as an authority on aerostation, and his opinion of the trial is consequently of the greatest value. This is what he wrote:

"During the last fifteen years no one in France, with the exception of M Santos-Dumont, who came direct from San Paolo to Paris for the express purpose, has made an ascent in a really steerable balloon; that is to say, in a balloon provided with a motor and propeller. Thanks to the perseverance and tireless activity of M. Santos-Dumont, who was the first to utilize in aerial navigation the light motor used in automobiles, a practicable solution of this stupendous problem has just been found.

Skill and Judgment.

"To do thus, to create what may now be called the art of areomatics, nothing less than the experience, practice and remarkably cool judgment and self-possession of M. A. Santos-Dumont was absolutely necessary. For it did not suffice to build a navigable ballon. The more difficult thing was to make the ascension in it.

"From this point of view," continued M. Aimé, "the value of the man adds so materially to the value of the system that it was not hazarding too much to predict boldly the decisive success that has crowned M. Santos-Dumont's trial trip to-day.

"The balloon with which the experienced aeronaut experimented is the fifth of a series that he has constructed, each carrying out in a more highly developed form the idea that forms the basis of the system. Its principal characteristics are: Diameter, 11 feet; length, 103 feet; four-cylindered petroleum motor, 16 horse-power, propeller screw measuring 4 mètres from blade edge to blade edge, and making 200 revolutions per minute. The machine is supported by a triangular framework made of aluminum and strengthened with pine, measuring nearly 60 feet in length. It is formed of three curvilinear scantlings bound together and joined with aluminum, united by wooden crosspieces and solidified by an ingenious network of piano wire.

"At a distance of 22 feet from one extremity of the framework in the centre of a triangular section, the motor is suspended by means of piano wire that causes it to bear a vague resemblance to a gigantic spider in its web. At the same distance from the other extremity is situated a basketwork car, in which the aeronaut takes his place, and where he commands the arrangements for lighting the motor and for starting the screw propeller. Cords work the rudder, controlling the escape valves and regulating the displacement of the guide rope from bow to stern, if I may use the term, by means of fine cords. The framework, with its motor and aeronaut's car, is suspended to the balloon by steel wires of such tenuity that they are invisible at a distance of 150 feet in the air.

"Let Go."

"At three o'clock in the morning the balloon was guided during a period of perfect calm from the Parc d'Aerostation, at St. Cloud, to the Long Champs race-course, and was given final touches in the presence of M. George Besancon, director of the 'Aerophile,' the organ of the Aero Club and of French aerostation, M. Gustave Hermite, several officers from Versailles and Mont Valerian and myself. The words 'let go!' were uttered by M. Santos-Dumont, who was alone in the car of the balloon. There is not room enough in it for an aeronaut much bigger than its designer.

"The words were the signal for the commencement of a series of experiments of the most conclusive character, which surpassed in importance any that have been made from the days of Montgolfier up to the present time. Six consecutive times the aeronaut made a complete circuit of the Long Champs race-course.

"It was proved that the airship has an average speed of 24 miles per hour; that it answered its rudder with most perfect obedient docility, and that the problem of landing was solved, each voyage round the race-course rigorously ending with a descent at a spot indicated beforehand. It returned time and time again to the previously designated spot, just before the tribunes, with mathematical precision.

Sailed Away.

"When M. Santos-Dumont had accomplished all these evolutions he turned the head of his balloon in the direction of Puteaux and sailed off to that place. Then he turned round sharply and came back to the starting point before the tribune.

"After taking in a fresh supply of petroleum, he made off toward the Eiffel Tower and reached it, at a distance of three miles in ten minutes. While over the Champ de Mars a slight accident to his rudder compelled M. Santos-Dumont to come down in the Trocadero Gardens. A tall ladder was very obligingly brought by some workmen and M. Santos-Dumont climbed up it to repair the defective part. When this had been done he started off again swept completely round the Eiffel Tower and came back at a breakneck speed to the tribunes on the Long Champ race-course, in order to reassure his friends who were alarmed at his long disappearance.

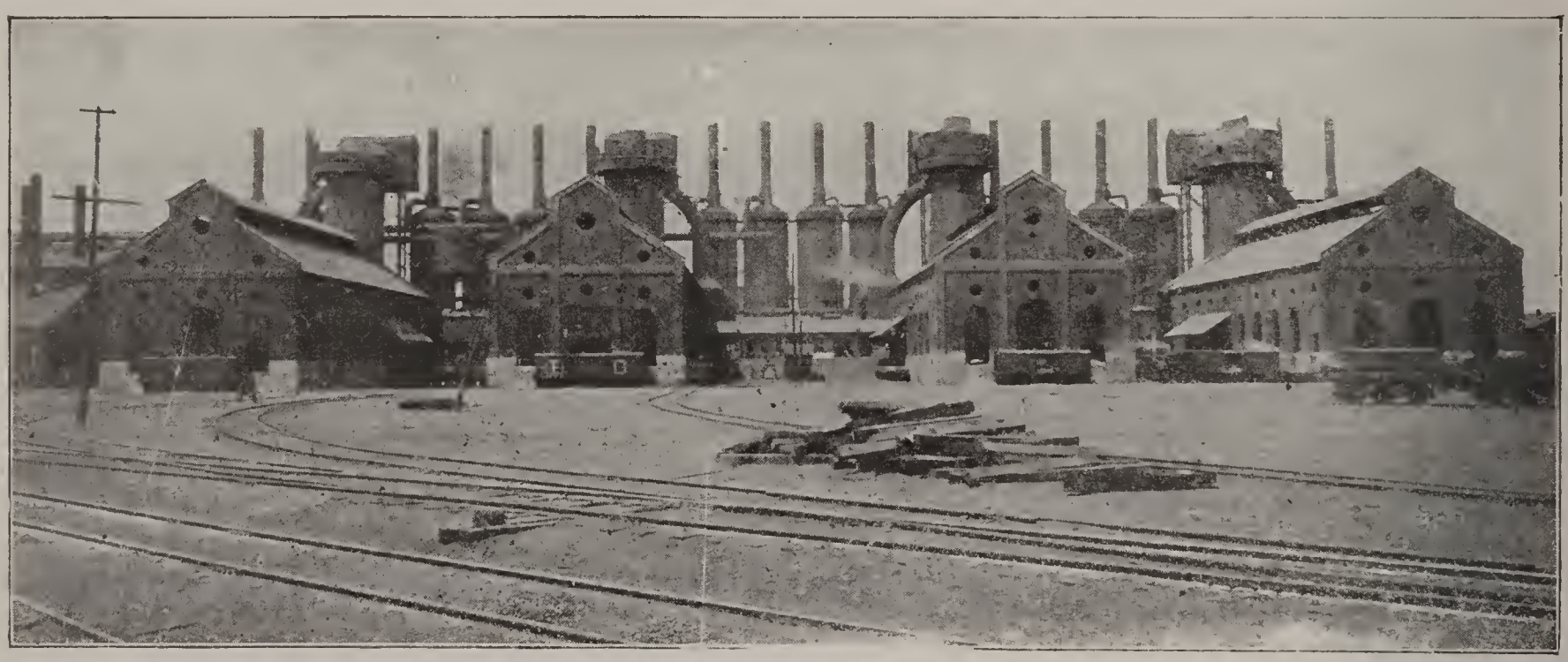
"Including stoppages, the voyage lasted one hour and six minutes. After a little rest, M. Santos-Dumont started off toward the rising slope behind Longchamp, crossed the Seine and brought back his airship to its home port.

STEEL ROLLING MILLS.

From crude iron ore to shining steel rails. How work is done in one of America's greatest industries. Millions made and invested in nature's great product.

NIGHT is the time when one should watch the process of converting crude iron ore into the long black steel rails that are destined to span the country. No display of fireworks can equal the grandeur of the great crucibles vomiting forth their masses of fiery metal. Many times the glow on the sky from these great mills can be seen great distances, and the reflection on the clouds often resembles a mountain on fire. The work in these rolling mills is hard in its nature, and to some degree dangerous, yet the workmen love it and take a pride in the fine little scars that seam their breasts, the result of their working stripped to the waist in a shower of sparks.

When a load of ore arrives from the mines it is brought up on side tracks where men with wheelbarrows can cart it down to the melting room. This is a great roomy place with no walls to speak of, and nothing but a sand floor. In one end of the room, reaching high up in the air, is the "cupola." In some mills this is fifty feet high. It is cylindrical in shape, like an enormous boiler



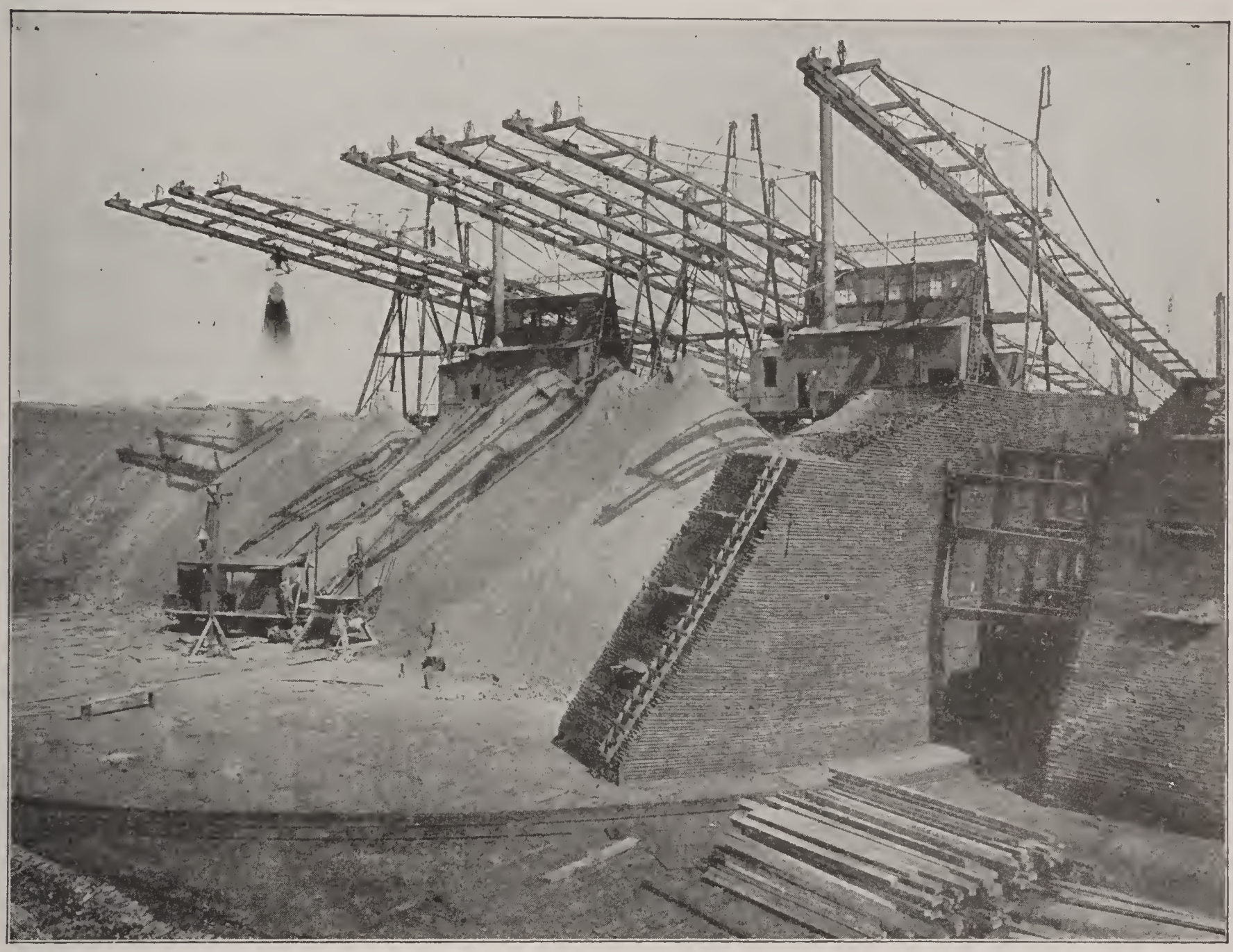
BLAST FURNACES.

The towers with the cupolas are the blast furnaces. Between the blast furnaces are seen the hot-air furnaces, of bottle-like appearance. Inside the four buildings (each one connected with a blast furnace) are cast the steel billets and ingots, which are later run through the mills and rolled into plates, rails or rods.

set up on end, and is lined with firebrick. The bottom has a sand bed, and just above this enters a blast pipe through which rushes the current of air that is to make the fire "blow." At the top of the cupola is a stack out of which the smoke and gases escape, and a little lower down, out, and just above these and running around the base are a number of holes or slits, called "tuyeres," surrounded by a wind box. This wind box is attached to the blast pipe and aids in the "blow."

The Cupola

man starts a fire of kindling wood and



UNLOADING IRON ORE.

This picture shows the trams over which the ore is carried in large buckets from the ships and dumped into the ore pile within the yards of the steel works. From these great heaps the ore is later taken to the blast furnaces for conversion into pig iron.

running around the cupola, is a platform called the "charging floor." An opening in the cupola even with this floor is called the charging "door," and it is here that the ore, coke and lime are dumped in when a melting is to take place. At the bottom of the cupola are a tap hole and a spout at which the molten metal runs

coke, and when he has it going well he dumps down through the charging door alternate loads of coke, lime and iron ore. When the cupola is nearly full and the blast is working well, the cupola man sits down with his pipe, to watch. Gradually the ore is heated through and begins to yield; and here comes in the use of the

lime. Many impurities, especially sulphur, are in the ore, which, if not removed, would make the iron too hard or too soft. The lime seems to have an affinity for these substances, and as the ore melts it takes them up, together with particles of the coke, and lets the melting iron run down to the sand bed at the bottom. At the tap hole, just above the wind box, is an opening covered with mica, where the process of melting can be watched by the cupola man. When he sees the first sign of dripping, he plugs the tap-hole up with clay, and then waits a little longer till he is ready to unload.

A STEEL RAIL MILL.

The steel ingot passes back and forth between the sets of immense rollers until it is finally delivered, at the left of the picture, a perfect steel rail, ready to do its part in the transportation of the world's products.

In the meantime men have been preparing the sand floor of the room into long troughs, one leading from the other, and all joining in one main trough that ends just under the spout of the cupola. Now the charge is full, and a man with a big mallet strikes the plug of the spout a blow. Out rushes the stream of fiery metal into the troughs to cool. Men with great wooden sabots for shoes, or boards on their feet, run about among the troughs and cover the iron with sand. As it cools somewhat by streams of water being thrown on the sand, these men run along over the iron and break it into short lengths or "pigs." These pigs may be shipped to foundries or other mills for casting.

At the steel mills, however, much of the iron is not cooled into pigs, but drawn off into little brick cars and carried at once to the steel-converting crucibles, thus saving a second heating. The cars run along rails that carry them right up to the top of another cupola-like affair. Here the iron is poured in, and a

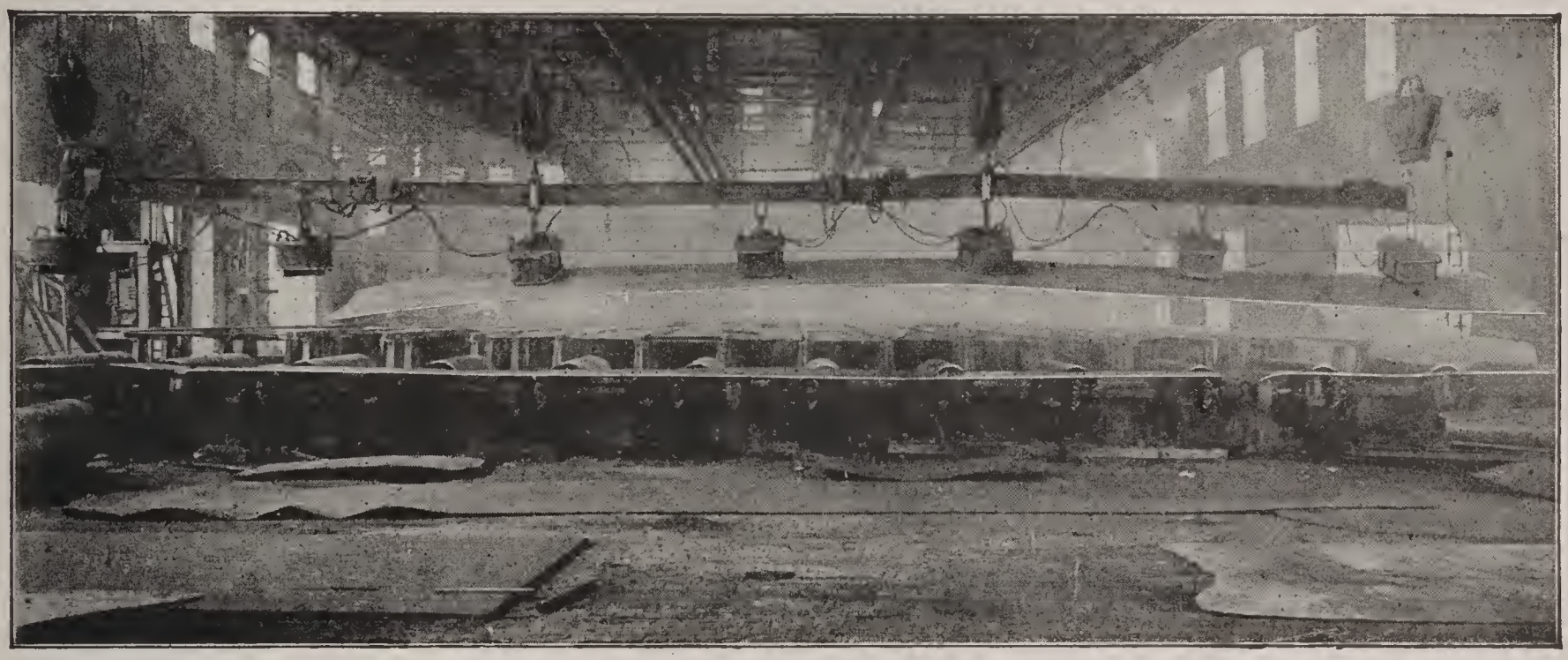
Tremendous Blast

set going. Sometimes oil is used to get the desired heat. Then a man comes along with a ladle full of "spiegeleisen," which is a combination of carbon manganese and other chemicals that works the great process of changing iron into steel. There are three grades of iron product: malleable or wrought iron, which is simply iron as we know it in pigs; steel, which is iron with an addition of 1 to 1½ per cent of carbon; and cast iron, which contains about 4 per cent of carbon. The more carbon added the harder and more brittle the substance becomes. When the carbon has been poured in, the blast spouts up for a while longer, and then the cupola, which is hinged, tips

over and with a shower of sparks the bright red steel flows out about as thick as tar into big oblong molds set on the sand floor, which, however, have only four sides and no top or bottom. There are generally a dozen or so of these molds full of glowing steel arranged in a circle on the floor waiting to cool. When their contents are sufficiently cool to handle, the molds are picked up by great cranes and tongs, and swung over to brick-covered cars. Here the steel "ingot," as the lump is called, is knocked out of the mold, and sent on its way to the rollers, while the mold is dropped back to its place to receive another charge.

In Making Steel Rails,

numerous rollers, each a little smaller than the one before it, are arranged in successive rooms. The red-hot ingot is dumped from its car on to a continuously



MAGNETIC TRAVELING CRANES.

Some steel plates are so large that they cannot be carried by hand ; consequently powerful electro-magnets are so arranged that—by the simple push of an electric button—they descend, and, grasping the hugh plates, convey them to any part of the mill desired.

travelling bed with arms sticking up from its chains. These pick up the ingot, and with the aid of a man who pushes with a crowbar, the mass of metal is run between two great rollers and reduced in width and thickness but greatly lengthened. This process is repeated again and again, each time the size diminishing one way but increasing another. Finally the rail begins to take on a shape, with flanges at the bottom and T-shaped head. Then the name of the mill is stamped in and holes are punched in the sides, so that they may be handled better when laid on the tracks. Then comes the sawing apart, by highly tempered saws lubricated with oil. The rail is gradually cooling all this time, and as it cools it warps. To overcome this it is placed in vises and straightened. The time occupied from the moment the hot iron metal leaves the ore-refining cupola till it is formed into heavy, perfect rails is, in a rush season, but a few hours.

PHOTOGRAPHY IN 1901.

PICTURES OF LIGHTNING, ELECTRIC SPARKS, OBJECTS TOO SMALL TO BE SEEN, AND OBJECTS AT A DISTANCE FAR BEYOND THE REACH OF THE HUMAN EYE.

IN the last few years many important inventions have been made in photographic circles. The X-rays are used in methods peculiar to the realms of photography. New sensitive papers have been introduced, especially the rough gray platinum kinds that give the effect of steel engravings. More improved plates for making exposures have given results never before dreamed of. Beautiful pictures of the heavens and nature are the result. Among other odd subjects for the camera are the lightning-flash and electric sparks. Meteorologists have been much interested in the results of pictures of lightning, and among other conclusions arrived at regarding these familiar electrical discharges is that they are crooked as they appear, and not, as some would have us believe, straight with

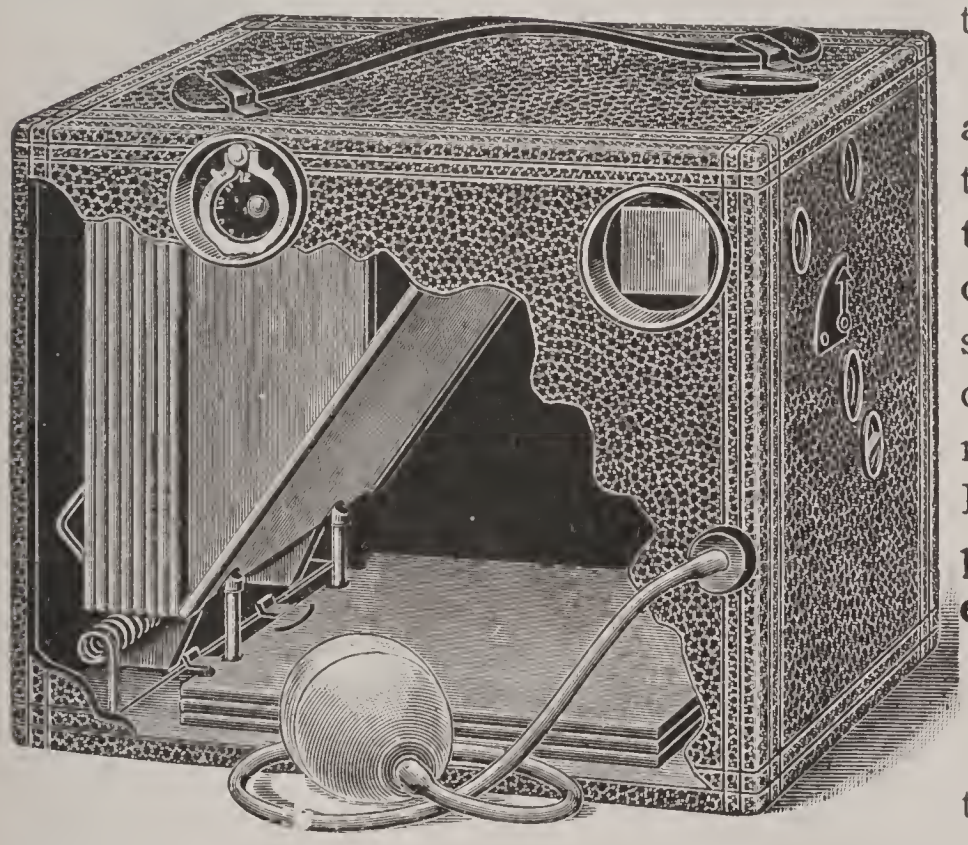
VIEW OF A COCOANUT-TREE TAKEN WITH AN ORDINARY CAMERA AT A DISTANCE OF 200 FEET.

a crooked effect from the background of clouds.

Electographs,

or pictures of electric sparks, are of great interest to scientists. These are produced by exposing a sensitive photographic plate to the path of a spark jumping from the poles of a static machine. The plate is enclosed in a dark envelope, and placed between the poles of the machine at right angles to a line that would connect them. The spark leaps out, punctures the envelope, exposes the plate, and rushing over the edge of the plate, leaps across through the air to the other pole.

COCOANUTS ON THE TREE. VIEW TAKEN WITH TELEPHOTO LENS, SAME DISTANCE.



One of the latest snap-shot cameras, arranged for carrying twelve plates without reloading. A pressure on the bulb operates the shutter which exposes the plate. Then the little screw at the upper left hand corner is turned one notch, and the plate is dropped down on the bottom of the camera, leaving a fresh one at the proper place ready for another exposure.

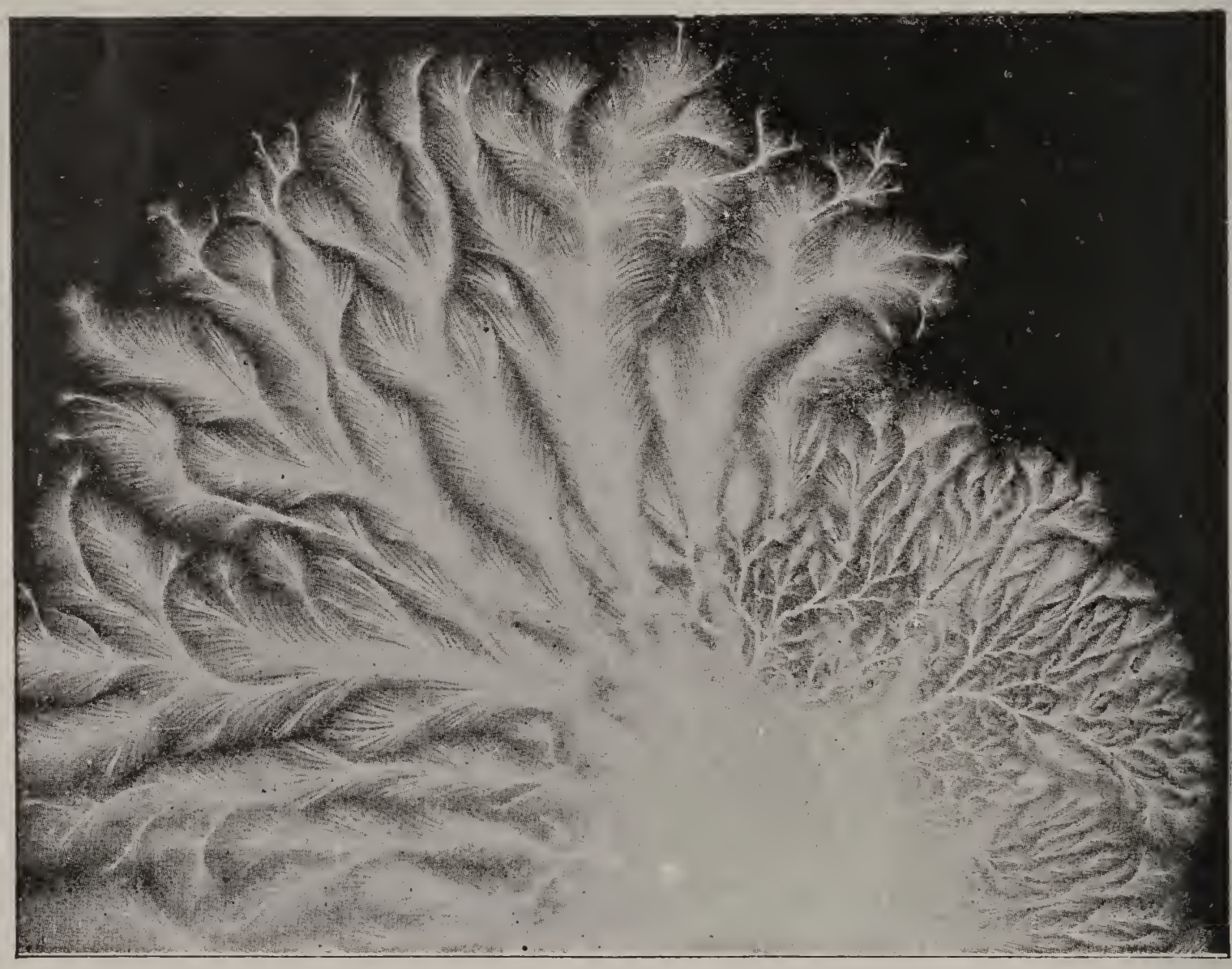
Some peculiar properties of electricity are thus learned; among others that electricity follows the line of least resistance through its conductor, whether it be air or of another sort, but in so doing it selects a number of special paths mutually divergent from each other, and hence does not travel in a mass through its conductor. From these experiments laws are expected soon to be formulated which govern this freakish fluid.

The Telephotograph.

Many instances arise where, because of the remoteness of the subject to be photographed, the operator secures very poor pictures, with only faint outlines, or at the best very small reproductions. To do away with this difficulty a new process, called telephotography, has come into use. It came about partly through the use of

ordinary field glasses and telescope for observing with the naked eye, and later on with photographic attachments to the great glasses in observatories. Now, however, cameras are made that may be carried around from place to place, and yet so arranged that if the view to be photographed is across a wide river, the far-seeing lens is simply adjusted, and the telephotograph made.

lens, back of which is a small negative or concave lens. The negative lens is the one that does the far-seeing work, for it magnifies the object. This lens may be taken out if desired and the camera used for ordinary exposures. After a common picture has been taken, the operator may replace the negative lens, and upon his ground-glass screen will be seen the same subject, only a great deal nearer and



AN ELECTROGRAPH OR PHOTOGRAPHIC REPRODUCTION OF THE LEAP OF AN ELECTRICAL DISCHARGE BETWEEN THE POLES OF A STATIC MACHINE.

Dwight L. Elmendorf has been as successful, perhaps, as any one in taking views of this kind, and it has been largely due to his work in experimenting with telescopes that a good camera has been developed. An arrangement that he has perfected consists of a rack and pinion lens tube, 3¼ inches long and 1½ inches in diameter, enclosing a fine rectilinear

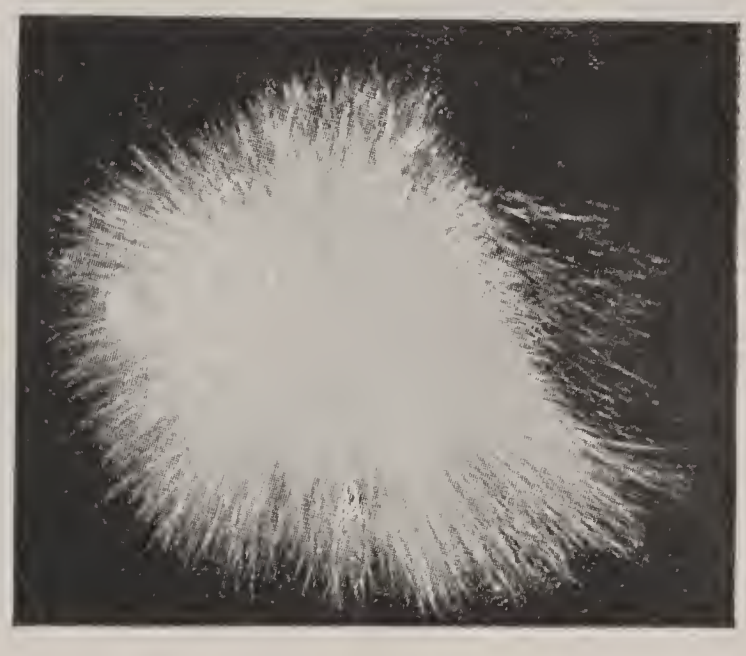
larger. If the outline is not quite distinct, by using the rack and pinion the regular lens may be moved forward or backward similar to an opera glass, and a perfect focus is obtained. Exposures with this kind of camera must necessarily be increased in length of time, for the reason that fewer light rays pass through the negative lens to the sensitive plate

This seriously retards taking pictures of moving objects at a distance, but ere long it will doubtless be overcome.

The uses to which this process may be put are various and wonderful. For pleasure alone the results are startling. Imagine yourself in the Alps, desiring to take a picture of a distant cap of snow miles away. Here is the means of gratifying this desire. In the war between England and the South African Republic, the former country used this process for taking pictures of camps and fortifications many miles off, and which could not possibly have been accomplished otherwise than by dangerous risk of fire from the Boers' guns. As soon as an apparatus is perfected that will take rapidly-moving objects, a kinetoscope attachment will be made that will enable the scientist to take and reproduce moving pictures of wild animals in their native haunts, and birds on the wing, long before they become aware of the approach of their enemy.

Microphotography

is rapidly coming to the aid of medicine. Heretofore it has been doubtful just what conditions existed in diseased tissues, but now, with camera and microscopes, lasting pictures may be made of life-destroying germs. The apparatus for such processes is simple, and even inexperienced amateurs may get beautiful results of flowers and animal life. A light tight box is arranged for the camera, with a very long bellows. At the end is attached a powerful microscope and farther up an



IMPRESSION OF AN ELECTRIC SPARK ON A PHOTOGRAPHIC PLATE.

ordinary photographic lens. The box must be held very rigid, for long exposures are the rule. When the plate is developed, one may see in great detail tiny objects not visible to the naked eye. These, when thrown on screens from magic lanterns, make beautiful enlargements.

Recent Occurrences

THAT HAVE MADE HISTORY.

The Rural Postal Delivery; British War in the Soudan; Arctic and Antarctic Exploration; Partition of China.

The Rural Postal Delivery.

THERE is nothing so remarkable in the history of the postal department as the recent growth of the free rural delivery. Within the last two years, because of the wish of the people whom it serves, it has so implanted itself upon the postal administration that it can no longer be considered in the light of an experiment. Some of the advantages derived from it are: Increased postal receipts, more letters being written and received, and more newspapers and magazines subscribed for, thus keeping people in country parts well informed on topics of the day, as well as better educating them. Land values are increased, in general about $2 to $3 an acre, because of better means of communication. Country roads must be improved for the carrying of mails, and here lies a great benefit to the farmer. In one county in Indiana the delivery was valued so much that the farmers spent $2,600 on grading in order to obtain it. Possibly the greatest advantage to the country man is better prices on his produce, because he can keep in daily touch with the market reports and can take advantage at once of high prices to sell. At the end of 1899 rural free delivery was in successful operation over 383 routes, radiating over forty states and one territory. The service was given to over 190,000 persons at an annual cost of about 84 cents a person. This was accomplished by an expenditure of $150,000, which was made available by an act of congress July 1, 1899.

British War in the Soudan.

The fanatically religious Dervishes, followers of the Mahdi and the Khalifa of Soudan, for eighteen years carried on a warfare with the English that was most discouraging to all attempts at civilization. The great Colonel "Chinese" Gor-

don in 1879 was governor of the country, and tried without success to quell insurrections. He was recalled to England, and at his departure new rebellion against the British authority broke out, headed by the son of a Dongola carpenter named Sheil Mohammed Ahmet, who called himself El Mahdi, the prophet of God. This man gathered under his banner thousands of fanatical Mohammedans, and ravished the country at the sources of the Nile River. England sent Colonel Hicks with 11,000 picked men against him, but the expedition ended in a massacre of the British. England, now awake to the enormity of the situation, sent Gordon back to capture and destroy the Mahdi. In 1884 he arrived at Khartum, was imprisoned, and before reinforcements under Gen. Sir Garnet Wolseley could arrive, had to surrender, and was then treacherously killed by the Dervishes. The Mahdi died the next year and was succeeded by Khalifa Abdullahi, who dispensed with the Mahdi's religious fervor, but lacked none of his wiliness. In 1896 the British renewed the war under General Kitchener, who, in order to carry the war into the enemy's country, built a railway over the desert, advancing as fast as it was completed, thus having a ready communication with civilization for supplies. In 1897 Berber and Abu Hamed were taken, and September 2, 1898, Omdurman, the capital of the Dervishes, fell. The following year, November 24, 1899, the Khalifa was killed in battle, and Lord Kitchener sent to London the terse message, "The Soudan may now be declared open."

TRYING TO FIND THE POLES.

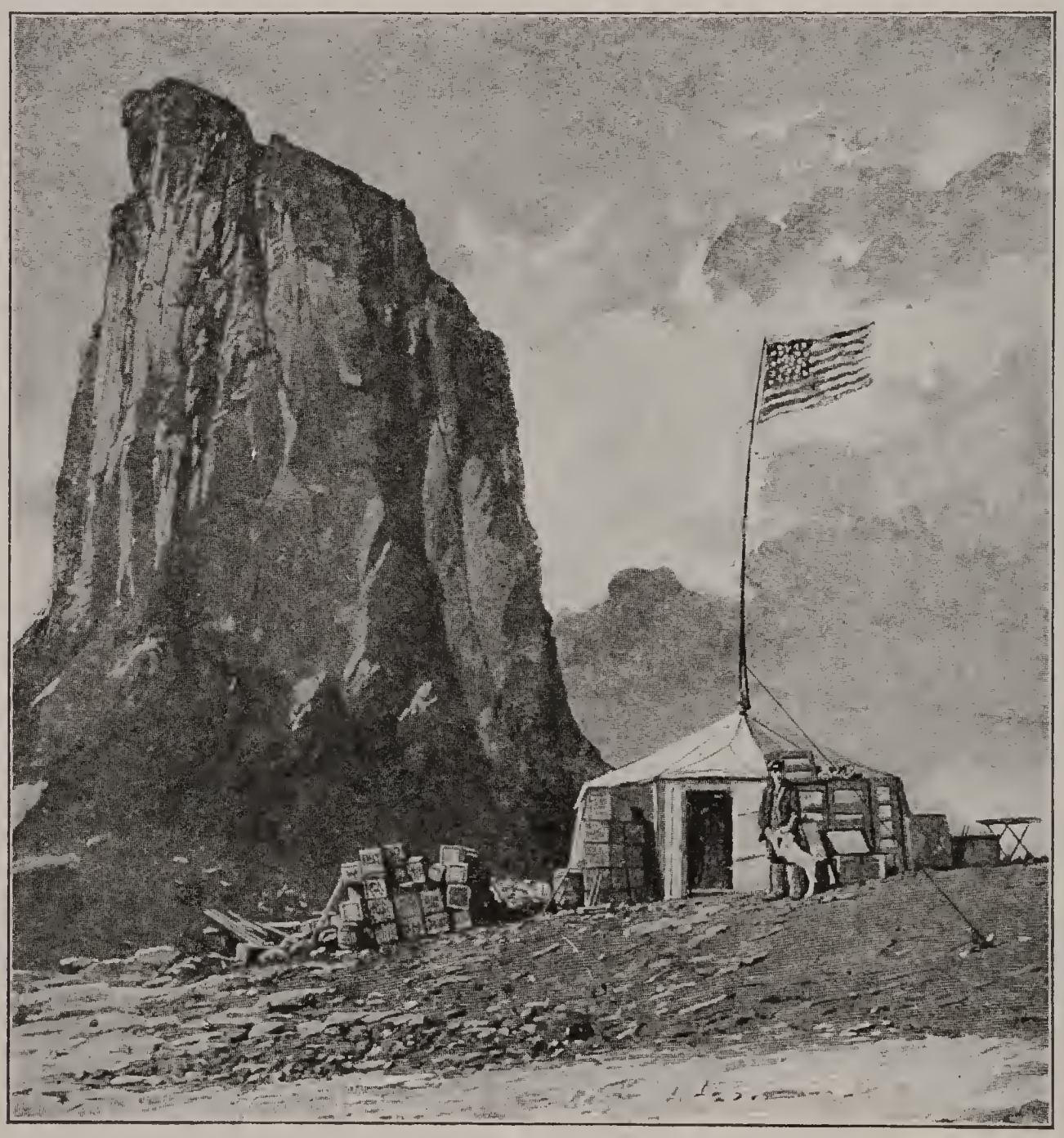
ARCTIC AND ANTARCTIC EXPLORATION.

OF all the baffling forces of nature possibly those experienced in polar expeditions are the greatest. For nearly three hundred years brave explorers have battled with icebergs and frozen seas, and all in the quest of those unknown lands about the poles. Of the many expeditions, successful and otherwise, those of Greely, Peary, Nansen, and Andrée are possibly the most important. America has given to the world much information on the Arctic Ocean, and Lieutenant Peary, of the United States navy, who is now in Greenland, has done as much for our glory in discoveries as any other. He made trips in 1886, 1891, 1894 and 1898, striving in the main to reach the North Pole by traveling across the land ice of Greenland. During the last trip, however, from which he has not yet returned, he intended to try a system of food posts, one after the other, farther and farther towards the pole. Andrée, who probably perished with his two brave companions, sought to reach the pole by balloon, figuring that the wind currents would carry him safely. His start was bad, however, and the last heard from him was a message taken from a carrier pigeon shot near Wadden Island, and which stated that July 13, 1898, the party was in good health. Nansen, a Norwegian, sailing under government instructions in the "Fram," used the method of drifting with currents toward the pole, and reached the farthest known point north, 86 degrees and 14 minutes, or within less than

four degrees of the object of all explorers' search.

The Antarctic Ocean

has not been as well explored as has its northern mate, but its region is full of interest. Three distinct points of land jut out of this great frozen sea toward the north, which are known as Wilkes Land, Enderby Land and Graham Land. These three lands form almost a triangle, with points on each side of the earth. About all that is known of them is the intense condition of cold that exists on the interior, as is found by the great currents of cold air that blow off the land. However, it is supposed that a great continent exists there, yet to be explored. The latest southern exploration was that of the "Belgic," sent out by the Belgian government. The party on this vessel was ice-bound below the seventieth parallel for eleven months, the farthest point being 71½ degrees. One important discovery made by them was that the southern magnetic pole, which governs the compass in the southern hemisphere, is some two hundred miles farther east than was formerly supposed.



ALMOST AT THE NORTH POLE.

The American flag flying from one of the series of relief and supply stations at Cape Tegetthoff.

THE PARTITION OF CHINA.

NATIONS SCRAMBLE FOR POSSESSION OF THE FLOWERY KINGDOM.

WHEN the war between China and Japan was ended and China was beaten so badly that she had to give not only cash indemnity but territory as well to her victorious opponent, the nations of Europe saw that there lay before them a country the most populous in the world, rich in its resources, and lacking force of character so much that they at once decided to grab as much of this easy prize as they could. Japan was deeded as indemnity Shashih, Suchow, Hang-Chow, the Liau-Tong peninsula, and the temporary possession of the port of Wei-Hai-Wei. Russia, France and Germany at once complained of this; Russia wishing Port Arthur, in the province of Liau-Tong, as a southern terminus of the Siberian railway. Russia got possession of Port Arthur with long leases.

Germany complained of this treatment, and a little later, rather opportunely, occurred the massacre of several German missionaries. This was used as a good pretext for demands upon China, and a seizure of ports was made by forces landed from German warships. After a dispute between the two governments, China paid a sum of $450,000 to the families of the murdered men, and gave a ninety-nine-year lease of the port of Kiao Chau and other territory seized by Germany to that nation. About this time Great Britain was fully awake to the possibilities of the situation, and began dickering for her share of the spoils. China had to have money to pay the war claims of Japan, and the only place to get it was London. Eighty million dollars were advanced to China by England, and as security the port of Wei-Hai-Wei was given over. England now controlled the gulf of Pe-chi-li and the great valley of the Yang-tse-Kiang River, with its tributaries, draining 800,000 square miles. Later France strengthened herself along the Tonquin frontier on the south; she also acquired a lease on the south coast, with large rights for railway construction. To offset this, England secured parts of Mirs Bay on the east, and Deep Bay on the west, as well as the island of Lantao.

The partition of China is yet only just begun, and with such weak forces, no general in command of her armies, and vacillating methods of government, her unique history is threatened with severe trials unless her vast hordes rise with knowledge of their power, and throw off the encroaching Europeans.

The population of China is nearly one-third of the population of the world. The population of China and India together is nearly twice that of all of the rest of the world.

The area of China is 4,218,400 square miles.

There are over three thousand letters or characters in the Chinese alphabet.

Pekin consumes 450,000 tons of rice annually.

American Expansion.

HOW THE UNITED STATES IS DOMINATING MODERN CIVILIZATION.

WHILE the United States government has not interfered in these partitions, her "sphere of influence" is not altogether wanting. Upon the signing of the Treaty of Paris, which closed the Spanish-American war, and which gave to American control the resourceful Philippine Islands and one island in the Ladrones, in the Pacific, besides the other American acquisitions, Europe at large felt that the United States were overstepping the famous Monroe Doctrine. Early in 1898 the annexation of the Hawaiian Islands had been accomplished by the United States, mainly as a war measure for protection in the Pacific Ocean. As it is now, the sun hardly sets on the American flag. Besides this great influence brought to bear on the far east through colonization and commerce with our dependencies and with pushing the war in the Philippines, we have made ourselves materially felt in Asia proper by exporting great quantities of supplies for the Trans-Siberian and Chinese Eastern railways. In Africa, as yet, we hold little other than protection over native-born American adventurers in the Boers' republics, but here also American push and energy have been felt. When Lord Kitchener was pushing into the Soudan with his new military railway, he found it necessary to

Bridge the Atbara River.

American engineers, with their usual foresight, jumped to the spot, and by promising quicker work than any competitor landed the prize. Thirty days from the time of the letting of the contract, the steel girders for the construction of the bridge were leaving the harbor of New York on their way to Africa.

But if we are pushing forward in war and in commerce, the result has not been without evil comment by many persons and nations. China, with her dread of the influence of the white man, has expressed, through Li Hung Chang, her dislike for the methods of the republic which brought forth the great Grant who was so popular with the Chinese. "Had he yet been alive," remarks Earl Li, "there would never have been this greedy expansion toward the weaker peoples' lands."

The South American republics, with whom we have always been on such friendly terms, look with fear upon what they think are mere aggressions. They now talk of binding themselves together for protection against any encroachments

further south, for with control of Cuba, which they think we will never give up, and the absolute annexation of Puerto Rico, they believe that it will not be long before the Yankees will strive still further to dominate the continent.

OUR WAR WITH SPAIN.

After the bloodshed of years on the island of Cuba, the destruction of the U. S. S. Maine by an explosion in the Havana harbor wrought the people of the United States to such fever heat that nothing could come but war with Spain. A court of inquiry was appointed by the President, and the finding was that the explosion had been caused by a submarine mine. This resulted in still greater ill-feeling between the two countries. April 21, 1898, Minister Woodford received his passports from Spain, and the next day the first prize of the war was captured, the Buena Ventura, by the United States gunboat Nashville. On the twenty-third, the President called for 125,000 volunteers, and the next day Spain issued a decree stating that a state of war existed with the United States. May 1, the celebrated battle of Manila occurred, in which Commodore, now Admiral, Dewey annihilated the Spanish Asiatic fleet, and took possession of the Philippine Islands. Campaigns were at once started in Cuba and Puerto Rico, while the Atlantic squadrons, increased by new vessels recently purchased from other countries and by ocean greyhounds pressed into the service by the government, blockaded the Cuban ports and tried to lay a net for the fleet of Cervera, which was on its way to protect the islands. July 1, the celebrated charges up the heights of El Caney and San Juan were successfully made by the American forces. The next day the Spanish attempted to re-take the heights, but were unsuccessful. American losses were: killed, officers, 23, men, 208; wounded, officers, 80, men, 1,203; missing, 81 men. July 3, Cervera's fleet attempted to run the blockade of the harbor of Santiago and was thoroughly overwhelmed, with a terrible loss of life and the capture of 1,300 prisoners, while on the American side only one man was killed. July 14, General Toral, commander of the military of Santiago Province, surrendered. July 26, M. Jules Cambon, the French Ambassador at Washington, in whose hands had been placed the affairs of Spain during the conflict, commenced negotiations for peace with the President. August 11, a protocol suspending hostilities was signed by W. R. Day, Secretary of State, and Jules Cambon, and the President issued a proclamation of temporary peace. August 13, General Merritt and Admiral Dewey, by combined attack, carried Manila by storm, and after five hours, fighting the Spanish surrendered the city, with about 7,000 prisoners. October 1, the commissioners for peace of the two governments met at Paris. December 10, the treaty of peace was signed by the representatives of the two governments. From the opening of the war till the date of signing the treaty but 233 days elapsed.

The casualties during this war were:

	Killed		Wounded	
	Officers.	Privates.	Officers.	Privates
Cuba.	23	237	99	1,332
Puerto Rico	...	3	4	36
Manila	...	17	10	96
Died of wounds	4	61	—	—
	27	318	113	1,464

The number of deaths by disease and accident from May 1 to September 30 was 2,565. Total of deaths during war from all causes, 2,910.

RICHES GREATER THAN KING SOLOMON'S.

KLONDIKE AND CAPE NOME GOLD DISTRICTS. DIAMONDS OF ENORMOUS VALUE.

Klondike.

THE fall of 1897 brought great quantities of gold from Alaska and the bordering Canadian frontier, with news of still greater veins to be opened up. At once great numbers of prospectors struck out for that country, expecting a duplicate of the "days of '49." They were not disappointed, for there were found the richest of deposits all along the Yukon and Klondike rivers. However, the hardships to be endured were so great that they have turned back many prospective miners.

For many years it had been known that Alaska was rich in gold, but that such great amounts would be taken out was never dreamed. The territory that is so rich in this product lies mostly just within the Canadian lines and between our border and the 138th meridian of west longitude, and has for central point Dawson City. Circle City, with a surrounding gold-bearing region, lies further west and within the United States territory, not far from Fort Yukon, on the river of the same name The Klondike is really only a creek tributary to the Yukon, while Lewis River, Forty Mile Creek, and Copper River are adjacent to it and bear gold. The Klondike, which names the district, was called Throchec by the Indians, which means salmon, possibly because of the great number of these fish there.

The Town of Dawson,

which was named after the man who fixed the boundary between American and Canadian possessions, is new, and is chiefly a source of supplies and a place of meeting. The site is on the east bank of the Yukon and on the north bank of the Klondike River, which empties into the Yukon at that point. The boundary line is seventy miles southwest.

The gold has been found in the small creeks that flow into the Klondike. First comes Bonanza Creek, a mile and a half back of Dawson. It is thirty miles long and very rich, but its tributaries are still better. Ten miles up it the Eldorado, for example, is the most productive streak that has been turned up; it is only six miles long, and is all staked out in claims, about $250 has been taken out in a pan, and it is estimated that the yield will be $20,000,000. Seven miles above Bonanza the Klondike receives the waters of Bear Creek, which is also rich in gold. Hunker Creek is fifteen miles up the Klondike, and up that is a little stream, about the size of a brook, which is called Gold Bottom. All these streams flow from the south, and they come from hills that must have lots of gold in them, for

other creeks that run out of them into Indian River show yellow, too. Indian River is about thirty miles south or up the Yukon from Dawson. Stewart River and Sixty Mile Creek, with their tributaries, all south, and Forty Mile Creek, with its branches, off to the northwest—all have gold. The average yearly yield of the Alaskan and Klondike mines is about $6,000,000.

The Largest Nugget

ever found in the Yukon country was brought to the surface in creek claim 34 Eldorado by Peter Gordt. It weighs six pounds, and represents $1,158 worth of gold.

Cape Nome District.

The most remarkable gold mining at present in the world, if not in the entire history of gold mining, is that now in progress at and about Cape Nome, on Norton Sound, Behring Sea, Alaska, situated about 225 miles north and west of the mouth of the Yukon River, or 135 miles from St. Michael's. Gold was first discovered on Snake River in the fall of 1898. In June, or early in July, 1899, some one of the stranded miners tenting on the beach, as the only unclaimed space, accidentally discovered gold in the sand at his feet. Never had such easy mining been neard of, never had it been found so unexpectedly and so opportunely, and it was not long before everything else was deserted for the seashore, and even women and boys of ten or twelve years were to be found as busy in the sand as the men were. At present it is estimated that 1,000 to 1,200 miners are at work on the beach, extending west for twenty miles. All these work with rockers, and they occupy just as much territory to the man or group as can work it. It is not unusual for one small square bit of beach to pan out $10 to $15 per hour, but, of course, the space is soon exhausted and the lucky digger must move to another spot.

Where Does It Come From?

This beach deposit of gold is as yet an unsolved problem. By some it is claimed that the gold in the sand, which is entirely "dust," has been washed out from the tundra by the waves at high tide and deposited through hundreds of years in the sand.

HYDRAULIC MINING IN THE ALASKAN GOLD FIELDS.

Cripple Creek, Colorado.

Cripple Creek district is now at the height of its productive history. The rate of growth in output from month to month is greater than ever before, while the gush veins, ' near the surface, have become strong ore bodies, with well defined walls, at from 300 to 800 feet in depth, with shafts extending

to the 1,000-foot levels. The Portland Company has a gold production record of $7,000,000, with dividends to date amounting to $2,377,080. Its territory consists of over 180 acres of claims on Battle Mountain, and the whole property is splendidly and thoroughly equipped with up-to-date machinery and buildings. The output of $7,000,000 has been secured from 2½ per cent of the total acreage, leaving 97½ per cent practically untouched. The production of the mine is now being limited to $200,000 per month.

The gross value of the ore marketed from the camp in one month reached $1,731,000. Of the material shipped, the cyanide and chlorination mills treated 24,950 tons, ranging in value from $20 to $35 per ton, while the smelters handled 11,000 tons, at an estimated value of $93 per ton, a larger figure than ever before for this class of material, demonstrating a gain in gold contents as depth is attained in working the mines.

South Africa.

Gold was discovered in the Transvaal in 1886, and since that time has been taken out in vast quantities. Cities have arisen as if by magic. Railways, telegraph and cable lines have been strung, and everywhere has been felt the power of gold. In 1898, gold to the amount of $74,220,000 was taken from this region, and the limit to the veins is not yet near.

Diamonds.

Though diamonds are now found in the greatest abundance in Brazil and South America, they were formerly obtained from India, Borneo and the Ural Mountains of Russia. The great stones of history have almost without exception come from India, though recently a number of diamond monsters have been found in South Africa, of which the most noted is the Excelsior, weighing 970 carats.

Occasionally diamonds come to light in other regions. The Piedmont plateau at the southeastern base of the Appalachians, between Virginia and Georgia, has produced some ten or twelve diamonds which have varied in weight from one to three carats, to the "Dewey" diamond, which weighed over twenty-three carats.

It is, however, in the territory of the great lakes that the greatest interest now centers, for in this region a very interesting problem of origin is being worked out. No less than seven diamonds, ranging from four to twenty-four carats, have been found in the clays and gravels of this region.

In 1883, a diamond was brought to Milwaukee and sold for $1. Later it was found to be a diamond of sixteen carats' weight. The woman who found it lived in Eagle, Wis., and the stone was picked up during the excavation of a well. Ten years later a four-carat diamond was found at Oregon, Wis., by a farmer's boy at play in a clay bank. A third diamond was found at Kohlsville. Another beautiful stone of six carats was found at Saukville, Wis., and was in the possession of the finder sixteen years before he knew its value.

Probably the

Greatest Diamond Mines

of the world to-day are those in and around Kimberley, in South Africa. Diamonds were discovered here in 1870, and since then the value of the world's output has been fixed at this point. Well may the value of these mines be imagined when we learn that since their first discovery diamonds to the value of $400,000,000 have been marketed from South Africa.

COMBINATIONS OF WEALTH.

The Greatest Problem of the Age.

WHAT ARE WE TO DO WITH CORPORATIONS AND TRUSTS?

THE beginning of the industrial combinations goes back a great many years. It dates from the abandonment of the spinning wheel and the knitting needle. When women went out of the stocking-knitting and rag-carpet business, that industry was taken up by men who had machinery with which to carry it on more cheaply and more quickly. When the cotton-gin was invented the industrial combination had its beginning. When the machinery that makes boots and shoes was invented the great boot and shoe factories were made possible, and the business of the individual shoemaker was taken from his hands and put into the hands of the capitalists. When the oyster men on the Long Island shore began to turn their oysters over to the owner of a big sloop, who took them to market, they economized time and made what was in principle a business combination like what are known as the trusts. The dairy farmer sends his milk to a co-operative cheese factory, where the work which was once done on his own place is done much more cheaply and much better; and he gets a better price for his product at a smaller expenditure of labor.

These combinations are being formed everywhere. Cartwright's power loom gives employment to half a million people in the United States, and their wages are $160,000,000 a year. Whitney's cotton-gin enables us to put on the market every year two hundred and fifty million dollars' worth of cotton goods at a price which makes clothing plentiful and cheap, but still gives employment to hundreds of thousands of men at good wages and brings to capital a fair return.

The Old Hand Process

of shelling corn was so slow that it would take one-third of the whole population of the United States working every day in the year to shell the corn crop of this country, if machinery had not been invented that does the work with marvelous rapidity and cheapness. The possibilities of economy in production are enormous. Invention is the foundation of industrial combination. These combinations have not only increased enormously the productive capacity of the people, but increased the wages of labor and the certainty and steadiness of employment, and cheapened the product of labor to the consumer. It is because of these combinations that we are to-day sending enormous quantities of manufactured goods to all the countries of the world. It is not alone capital which has entered into combinations. Labor has its combinations, and they will increase in strength.

The danger which confronts industrial combination is the danger of over-capital-

ization. We have had some evidences of a disposition to over-capitalize already, and too much stress can not be laid on working against it. It should be regulated by law. This danger was more serious once than it now appears. We were threatened not long ago with a repetition of the South Sea bubble. The story of

The Trusts

has created an epidemic of desire to acquire sudden wealth. At intervals the public hears of men who have risen from comparative poverty to great riches in a short period of time, and others wish to do likewise.

Aside from the question of over-capitalization, the trust is in a large measure on trial. It was not so many years ago that there was a bitter public sentiment against corporations. Every effort was made, especially by adverse legislation, to discourage them. After a time men began to realize the benefits of the corporate form, and now recognize its advantages. The same feeling exists to-day toward great industrial combinations. It found expression recently in Missouri, in the passage of a law against the department store. In one respect

The Department Store

is like what we know as the trust. The man with small capital—say ten thousand dollars—is doing a business of one hundred thousand a year, and has to make at least five per cent on the gross sum to pay the expenses of his establishment and support himself. Along comes a department store and goes into competition with him. That store does a business of a million dollars a year, and can figure on a fair profit if it makes only one per cent on its gross receipts. The one-per-cent store drives all the little people out of business, and they must either move to some smaller place or quit business.

The feeling of twenty years ago against the Vanderbilts is being duplicated to-day as a result of industrial combinations. It is a hatred of the very wealthy, and a desire to deprive them of the greater part of their wealth. Whether it will find expression in stringent legislation against the trusts, no one can tell now. The American people, when they have had time to consider a matter carefully, are pretty sure to form a correct judgment about it. They sometimes act hastily and do wrong; but they are sure to come out right in the end.

The Trust is on Trial.

If it proves, like the corporation, to be inoppressive, and a necessity to the conduct of certain operations which are for the public good, it will live. If, on the other hand, it oppresses the people, they will very quickly put a stop to it. If it violates public sentiment, it cannot live—if it puts into the hands of a few men the manufacture or distribution of any article of prime necessity, so that the American people feel that they are dependent on any set of men for coal or steel or anything which is in universal use, it will die.

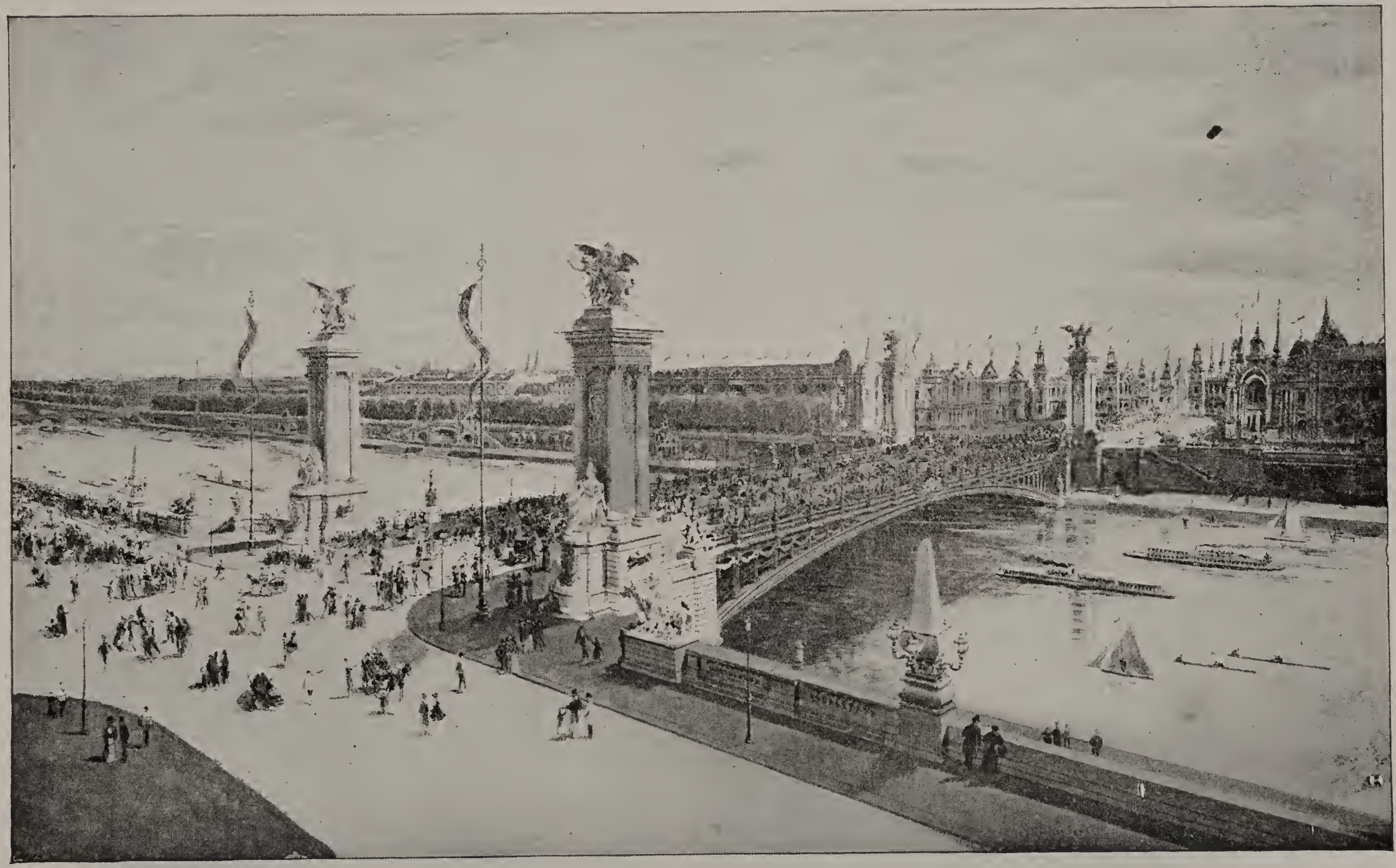
The Carnegie Steel Company, with its capital of $250,000,000, and the Federal Steel Company, and the American Company, are of enormous wealth and power, and each controls a large part of the trade. But they operate independently of each other, and it is possible for the other steel and iron plants also to live; hence there is little popular feeling against them. If they combined to form one gigantic corporation, and to crowd out some of the smaller though still important makers of iron and steel, they will find public opinion operating to bring about legislation to restrain them, and

THE ROENTGEN OR X-RAY SHOWING A BUTTON LODGED AT THE ENTRANCE TO THE LUNGS. SEE HOW PLAINLY THE RIBS SHOW.

X-RAY USED UPON HUMAN LEGS SHOWING THE CONFORMATION OF THE BONES: THE SEPARATION BETWEEN THEM AND THE ENVELOPMENT OF FLESH.

BIG TREE "WAWONA," MARIPOSA GROVE, CALIFORNIA

28 FEET IN DIAMETER AND 275 FEET HIGH



BRIDGE ALEXANDER III, PARIS, AND EXPOSITION BUILDINGS, 1900

eventually to break up their business, if it did not break up through the natural operation of the laws of trade.

The Whisky Trust Met Its Fate

without the intervention of the law-making power. It undertook to do so much for its stockholders that it actually made it profitable for the man of small capital to start in business; for if he could not compete with the trust he could at least sell out to it; and in time the building of distilleries to sell to the trust became a recognized industry.

It remains to be determined whether the regulation of the trusts is a matter for Congress, or, as the Attorney General holds, for the States which charter them.

South Africa and the Boers.

England's Conquest of the Transvaal.

THE clash of arms in South Africa between the forces of Great Britain and those of the two Dutch republics, the Transvaal, otherwise known as the South African Republic, and the Orange Free State, is the final outcome of a state of ill-feeling that dates back to the beginning of the century. South Africa was originally settled by the Dutch. Huguenot refugees from France followed and intermarried with the Dutch. The Boers, or Dutch Afrikanders, of to-day are, therefore, a mixed race, a fact that is shown by the names of their leaders, that of President Kruger, for example, being Dutch, and General Joubert's being French. The colonists were always restive under the control of a European government, and in 1795 threw off the allegiance to Holland.

The British Gained Control

the same year, and with the exception of the brief period from 1802 to 1806 have been supreme in Cape Colony ever since Holland renounced all claims to the Cape settlement in 1814, in consideration of the payment of $30,000,000 by England.

From the first the Boers chafed under the British rule, and when the measures abolishing slavery throughout the empire were adopted, and the Boers were compelled in 1834 to free the native Africans whom they held in slavery, their dislike for the British was intensified into bitter hatred.

The Life of the Boers

at this time was very primitive. With their herds and their slaves they wandered from one pasture land to another, like the patriarchs of the Israelites, to

whom they loved to compare themselves. The British government appropriated $6,000,000 with which to indemnify the slave-holders for their losses, but payment was made in orders on London, which the Boers were compelled to discount at ruinous rates at the Cape. In 1835-36, immediately following the liberation of the slaves, occurred what is known as the "Great Trek," or migration. About 10,000 Boers "trekked" into the wilderness north of Orange River, where they hoped to be free from British control, and at liberty to treat the natives in accordance with their inclinations. Here they maintained themselves in independence at the cost of

Continual Warfare with the Natives,

until, in 1848, the British intervened to establish order, and took possession of the territory, naming it "Orange River Sovereignty." This action was taken at the solicitation of many of the inhabitants, who had grown weary of the struggles with the native tribes. The change was very distasteful, however, to a large party of the Boers, and these immediately revolted under the leadership of Pretorius. Having been defeated by the English under Sir Harry Smith, they "trekked" once more, this time into the country north of the Vaal River, where they established what became known as the

"Transvaal" Government.

After a few years, experience in control of the Orange River Sovereignty, the British reached the conclusion that it was not a desirable acquisition, and in 1852, by terms of the Sand River Convention, gave the Boers liberty to organize a government of their own. The Orange Free State was immediately established, and has maintained its independence ever since, unhampered by the English. The history of the years that follow is a record of constant warfare with the native tribes until, in 1875, threatened with extermination by an outbreak which they were unable to control, the Boers of Transvaal petitioned England to come to their assistance. England's control of the territory was the price asked, and April 12, 1877 Transvaal was annexed to Cape Colony. The danger past, the Boers repented their bargain and revolted in 1880, defeating the British in three engagements, in the last of which, the famous battle of Majuba Hill, Sir George Colley was killed. By a convention in 1881, signed at Pretoria, Mr. Gladstone's government restored independence to the Transvaal, now known as the South African Republic. It was clearly understood, however, that the Transvaal was to remain under the suzerainty of Great Britain. The Boers were not satisfied, and in 1884 negotiated a new agreement with Great Britain, known as the London Convention of 1884. By the terms of this agreement no restriction was placed on the independence of the South African Republic, except as expressed in the following statement: "The South African Republic will conclude no treaty or engagement with any state or nation other than the Orange Free State, nor with any native tribe to the eastward or westward of the Republic until the same has been approved by Her Majesty, the Queen."

The Discovery of Diamond Deposits

at Kimberley in 1870, and later on of gold in 1886, in the Transvaal, wrought great changes in the condition of the South African settlements. A mighty tide of immigration set in. Railroads and cities were built, and from a position of isolation South Africa became a theater of the greatest industrial activity on the part of enterprising men from all the civilized

countries. The city of Johannesburg sprang up as by magic, and now has a population of over 100,000. The Boers classed all new-comers as

"Uitlanders"

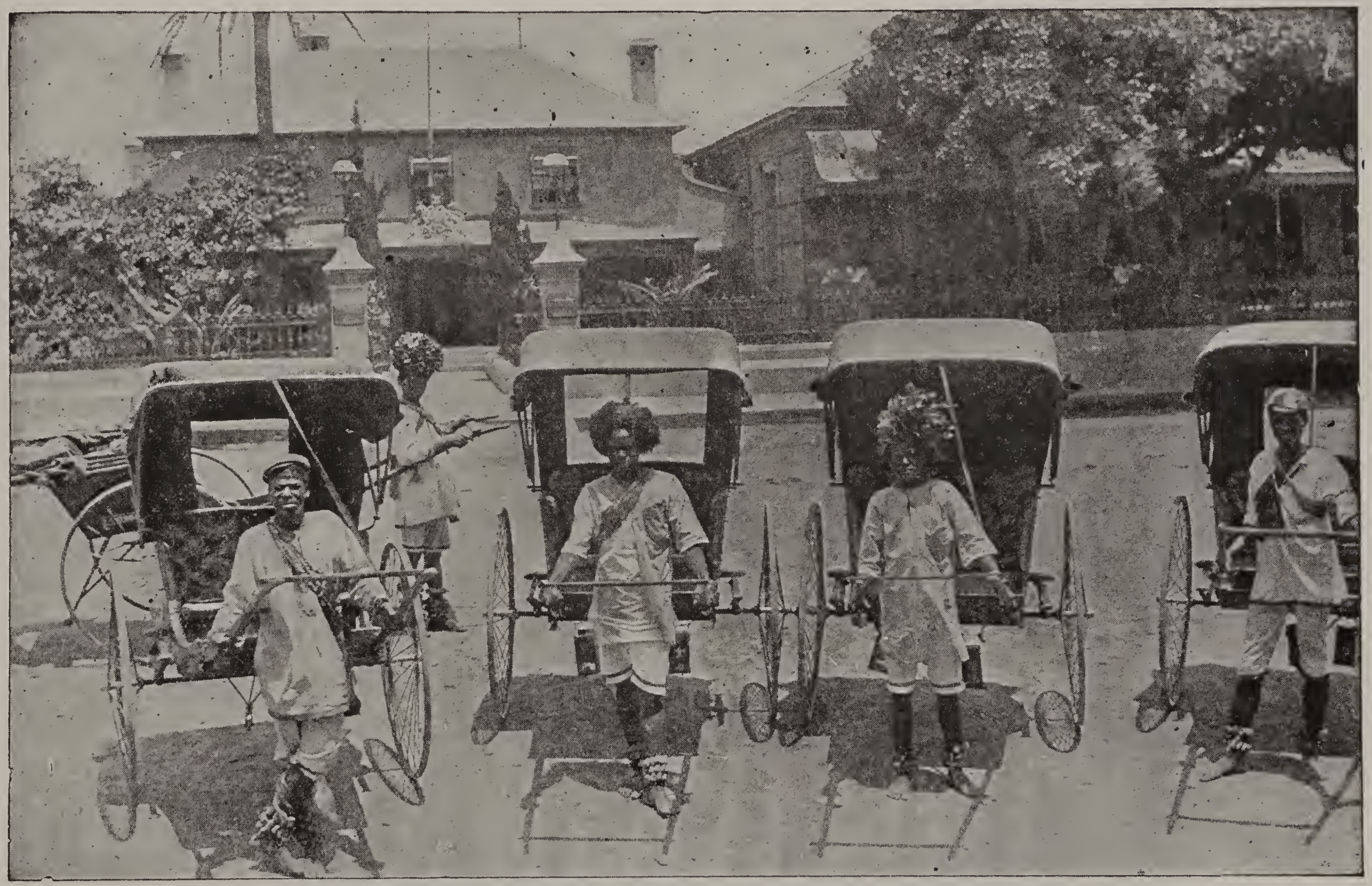
or foreigners, and viewed with alarm the rapid increase of their numbers. To-day the Uitlander population of the South African Republic is at least twice as large as that of the Boers. In order to maintain themselves in control of the government the Boers denied the Uitlanders the privilege of the ballot. They were taxed heavily, and claimed to be subjected to other abuses, of which they complained to the English. Their discontent reached a crisis in 1896, when a band of raiders under the leadership of Dr. Jameson entered the Transvaal with the purpose of intervening by force of arms in behalf of the Uitlanders. The attempt was a failure, and had the effect of intensifying the bad feeling between the English and the Boers. It was firmly believed by the Boers that the English government connived at the effort to incite rebellion, but this the British denied.

Since that time agitation has been kept up more or less constantly by the Uitlanders for the redress of their grievances. In negotiations which preceded the outbreak of the hostilities, the Boers contended that as the word "suzerainty" was deliberately left out of the London Convention of 1884,

British Suzerainty

no longer existed. This the British government refused to admit, and to emphasize its demands for reform began to concentrate troops on the border of the Transvaal. It became evident to the Boers that they would be compelled to yield or fight. They were unwilling to yield, and finally made a peremptory demand on Great Britain to withdraw her forces from the border of the Transvaal, stating that a failure to do so within forty-eight hours would be considered an act of war. The demand was refused, and the Boers immediately began hostilities in conjunction with the government of the Orange Free State, which served notice on Great Britain that it would support the South African Republic.

The division of the vast continent of Africa is really under way, and land-hungry England, always in the van of civilization and colonization, is in prospect of its own vast share. At present fourteen countries, with population aggregating 50,000,000 people, the greater majority of whom are blacks, cover a territory 2,600,000 square miles in extent, and are all under the shadow of the Union Jack. Diamonds and gold are the cause of the warfare that is ravaging the entire continent of Africa, and hardly can it be wondered at when in the last thirty years diamonds to the value of $400,000,000, and gold in 1898 to the amount of $74,213,953, were taken from South Africa alone. Foreigners with push and enterprise are populating and improving the country, and wish the Boers to do likewise. The Dutch, however, are a rather unprogressive lot, standing in the way of further encroachment this time with armed forces, which, it is likely, will eventually have to give way to the progress of Great Britain.



THE FAMOUS RICKSHA BOYS OF DURBAN, SOUTH AFRICA

THESE VEHICLES ARE USED PRINCIPALLY BY BUSINESS MEN IN GOING TO DIFFERENT PARTS OF THE CITY. ALL THE BOYS ARE ZULUS AND WEAR BEADS AROUND THEIR ANKLES CONTAINING SMALL STONES WHICH RATTLE WHILE THE BOYS ARE IN MOTION

How Glass Is Made.

Testing the Puddle—Extraordinary Heat Required—Workmen Must Have Great Endurance—Cooling the Mold—Making the Thermometer—Casting a Lens.

OF all forms of glass making that of casting and finishing the great lenses to be used in telescopes and microscopes is perhaps the most interesting and certainly is the most difficult and exacting of manufacture. The minerals from which glass is made were formerly mostly what scientists call silicates, such as potassium, lead, soda and lime, but now have been added to these ingredients phosphorus, magnesium, tin, iron, bismuth and numerous other elements. In making a huge lens the proper formula of ingredients is mixed and heated for weeks in huge yellow porcelain crucibles, specially prepared for the occasion, and which with one baking have served their purpose and are thrown into the scrap heap. Within the walls of a great furnace the terrific heat of days and days finally brings the molten mass to the proper consistency, and after it has been tested repeatedly through the "glory" hole,—about as big as a man's head—the large iron mold that is soon to receive it is brought up between the heating furnace and another furnace known as the "cooler," ready for the pouring.

CASTING A GREAT LENS IN A GLASS FACTORY, THE HOT METAL POURING INTO THE MOLD.

Testing the Puddle.

The master tests repeatedly the glass through the hole and sees by the "stirring paddle" that it is just right. Then he dusts the inside of the iron mold with a quantity of fine

sand, that the glass may not absorb any impurities from the iron. On a signal a number of workmen begin to tear down the wall of the furnace and others bring forward a huge pair of tongs set on wheels, which will soon be attached to the glowing crucible within and drag it forth. When the wall is all down the tongs are shoved forward and fitted under a ring that encircles the middle of the crucible. At the other end of the tongs, averting their faces to avoid the intense heat, the workmen bear down to lift the crucible, lever-like, from the floor of the furnace, but it is stuck fast by the overflow of glass. Very carefully they bear down harder, and finally the fervid mass is wheeled out into the casting room. Here, lest it lose too much of its heat before the pouring, a mat of asbestos is thrown over it. Now the grappling irons are changed so that a pressure of a hilting bar will overturn the crucible. At the word from the master workman the men bear down and gently, without hiss or noise, the fiery mass flows out into the mold.

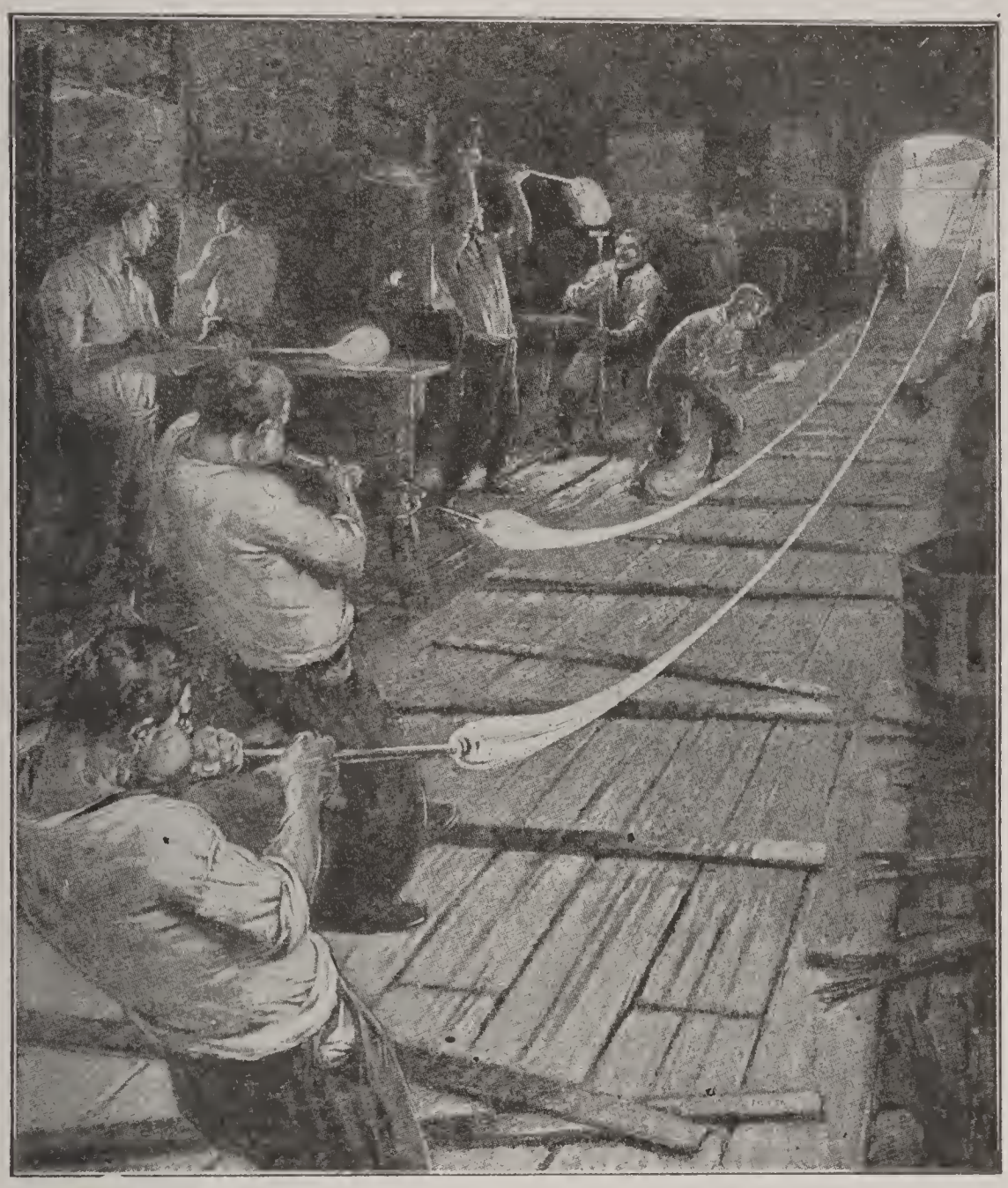
GLASSMAKERS BLOWING BOTTLES, CHIMNEYS AND OTHER GLASSWARE. A FURNACE SCENE.

Cooling the Mold.

Now the mold is covered with an iron lid and taken by a crane and lifted to a little portable tramway upon which it runs into the cooling furnace. Here for several weeks the glass gradually gives up its heat and at last emerges after a week or two, a gray mass which resembles nothing like a lens, but rather a mass of sanded glass. This must now be polished for some time until it is clear,—not to be used yet for science, but simply for a test. If no flaws are found the lens is sent back to heat for several weeks and to perfectly anneal. After that it cools gradually for about two months, and then is ready for the lens polishers. The bare glass for such a lens is worth $5,000. The additional work of the lens polisher brings the price of a large lens to about $25,000.

There are hundreds of other kinds of glass manufactured, each with something of a different process. In making fine thermometer tubes a very interesting method is employed. Inside a long cor-

ridor are furnaces for heating the raw materials into glass. When the right mixture is found a boy workman picks up a large blow pipe and jabbing it into the molten mass attaches a lump of it on the end of his pipe. This he blows and twirls until it assumes the shape of an acorn about the size of an orange. He now adds a little more glass, and then turns it over to a brawny workman who blows it and rolls it on an iron kneading board and then adds more glass.



BLOWING GLASS FOR THERMOMETER TUBES.

Another workman quickly attaches the end of another pipe to the mass and both men start to run backwards away from each other down the corridor, all the while blowing as if their cheeks would burst. In a few moments they have a thin tube as small as a little finger and some three hundred feet long lying on the floor of the corridor. This cools rapidly, and is then broken up into short lengths to go into barometers and thermometers and to be used for other scientific work.

THE SAULT STE. MARIE.

A Great Canal of Commerce—Building of the Locks—Annual Traffic Enormous—United States Controls.

EARLY in the first quarter of the century the people of the State of Michigan began to realize what enormous interests were bound up in the problem of constructing a serviceable canal at Sault Ste. Marie, or Saint Mary's Falls, commonly known as the "Soo." As the connecting link between Lakes Superior and Huron this narrow ribbon of surging water practically controlled the lake traffic of the great northwest. Freight rates on the railroads had always been higher than by the water, and, since the cost of shipping is about three-quarters of a mill a ton for each mile traversed by water compared to three mills per ton by rail, the vast saving to the great grain and ore producing west can readily be seen.

In the earliest history of the west the

THE CHANNEL OF THE "SOO" CANAL.

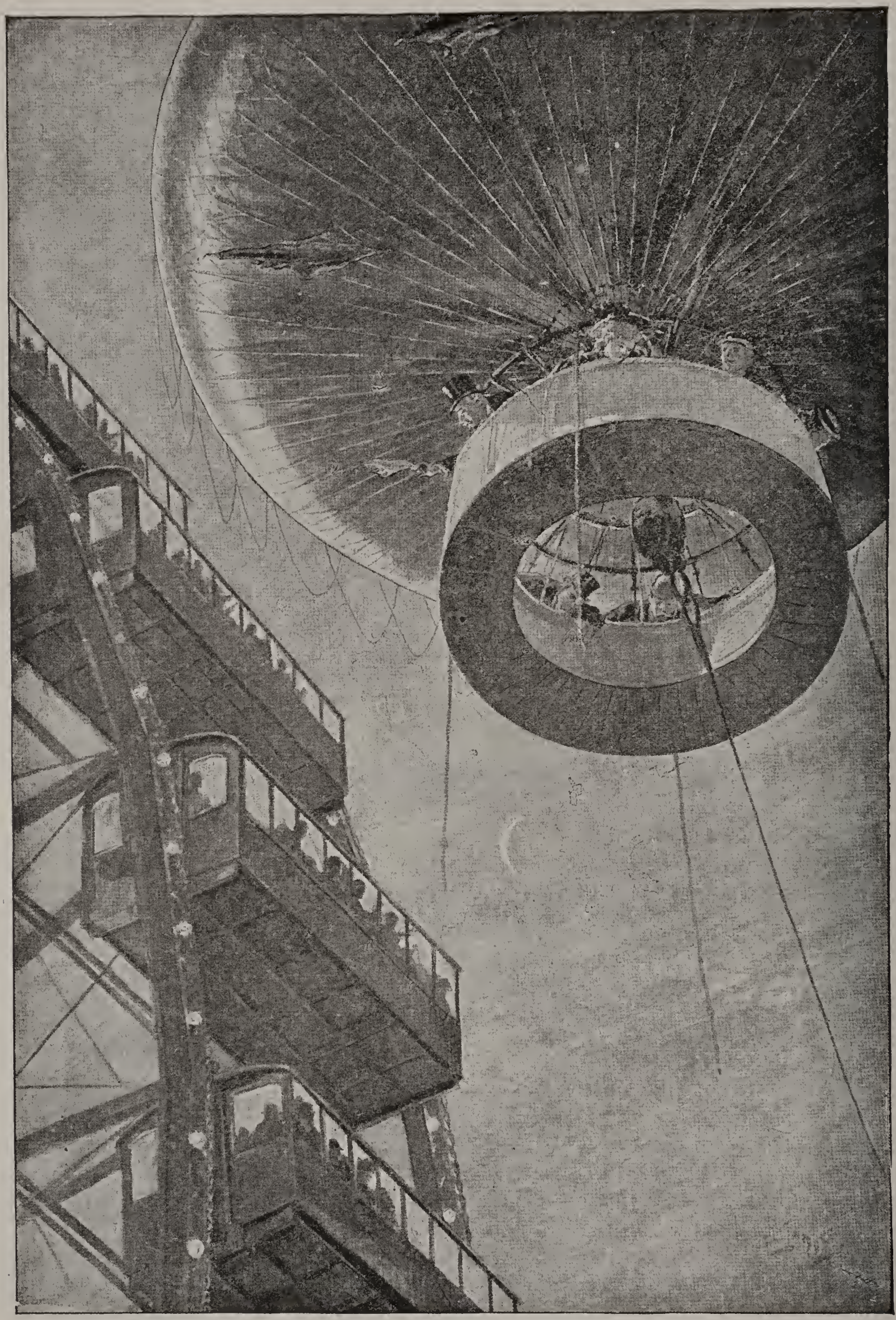
Thirty-eight feet deep, carrying 18,000.000 tons of commerce annually.

EMPEROR'S PALACE, BERLIN

FENCING EXERCISE IN GIRL'S GYMNASIUM

A CENTRAL ELECTRICAL STATION

BY THE TURNING OF A SWITCH ON THE LEFT SIDE OF THE PICTURE, ONE DISTRICT IS LIGHTED. BY THE TURN OF ANOTHER THE SAME WILL HAPPEN TO ANOTHER PORTION OF THE TOWN AND SO ON UNTIL EVERY PART IS LIGHTED



MEETING IN MID-AIR OF BALLOONISTS AND RIDERS
ON THE FERRIS WHEEL

settlers saw that an advantage was to be had by building a canal at this point, and accordingly they constructed a meager set of locks by which the fur-carrying canoes of the traders might be let down the nine-foot incline. After Michigan took up the matter Congress was petitioned and a grant of 750,000 acres of land was made for the purpose of establishing a suitable

LOCK HOUSE AND HEAD OF THE "SOO" CANAL.

canal service. Work was begun on the canal, and so greatly had the lake traffic expanded that the locks when completed by the State were four times as large as at first contemplated. This system was seen to be inadequate, and the federal government was asked to assume charge of the future work, and did so in 1870.

National Control.

The control by the United States has resulted in the building of two magnificent locks, one of them the largest in the world,—and both operated absolutely free of cost to vessel interests. The smaller lock, which cost $2,500,000, is over 500 feet long and 85 feet wide. The larger measures a little over 800 feet in length, and is 100 feet wide. It cost over $5,000,000, but so effective is the construction that four mammoth lake steamers can lock through it together. Both locks let vessels down an incline of eighteen feet. Just opposite these two and on Canadian soil the Canadian government has built a lock similar to and almost as large as the larger of the American locks. The "Soo" is constructed of stone and concrete with mammoth metal gates. When the locks are to be used by vessels water is let in through numerous pipes which need scores of men to operate them.

The magnitude of the traffic that annually goes through this waterway surpasses that of the Suez canal. Freight rates on America's inland seas are the cheapest of any in the world; besides the natural position of the "Soo" is that of the gateway for all the northwest. Coal to the value of $10,000,000 is annually carried through these locks, as is also flour worth $35,000,000, wheat worth $50,000,000, $30,000,000 in copper, $35,000,000 worth of iron ore, and lumber to the value of $12,000,000. The total value of products carried through this waterway is estimated at $240,000,000, while the cost of carriage is only $8,000,000.

HUNTING THE WALRUS.

Great Danger to Life in the Sport—Use of the Harpoon—Winchester Rifles Employed—The Animal Tries to Escape.

A VERY profitable yet dangerous enterprise is carried on by Eskimos in the Arctic seas. It is walrus hunting. In hunting the walrus according to the Eskimo style, a whaleboat is used. Usually six or eight of these little men man a stout whaleboat which is let down from a larger craft in which they are making a cruise. The implements used in the capture of the walrus are a harpoon, several yards of stout rope, and a Winchester rifle.

The animal is sighted and the whaleboat lowered to make the attack. When the hunters come within from five to twenty yards of their prey the harpoon is thrown. If the shot is true the harpoon penetrates the skin of the animal and sinks several inches through the blubber and flesh. Once inside the walrus the handle of the harpoon becomes loose and the barb or head sticks in the animal. A line is attached to this barb so that the harpoon head takes a position horizontal to the cut. Thus fastened, it is impos-

THE MODERN WALRUS.
After capture and on shipboard. Weight, 1,800 pounds.

sible for the animal to get away unless the rope breaks.

The animal then tries to escape by swimming. The gun is brought into play at this stage of the game. It often takes six or seven shots before the animal is killed. His carcass is then drawn to the boat until a lance thrust can be made at the vital parts behind the flipper, near the heart and lungs. According to the Eskimos, a walrus shot on the ice will not be killed, as a single shot is insufficient. The dead animal is then towed to the vessel, where he is hoisted by means of pulleys to the deck and quickly disposed of.

BUILDING OF SHIPS.

England Leads all Countries—Steel Ships Are in Demand—Method of Construction—Ships for Use in War—Wonderful Progress in Designs.

ENGLAND leads the world in ship building and in the shipping industry. Previous to 1860, when metal ships began to gain the supremacy over wooden vessels, England possessed what might be called a monopoly in this branch of work, but soon after the inception of steel ships a change gradually took place. Germany, which had placed all her orders for ships in English yards, in 1865 commenced the establishment of a ship-building industry that in 1900 stands before that of any other continental country in Europe. Stettin is the German town containing the ship yards where the "Deutschland," the fastest of ocean greyhounds, was built. America, too, has made great strides in ship building since 1888, which year also marks the time when Germany struck out along lines of independent progress.

Between the years of 1860 and 1888 both Germany and America were placed at a disadvantage because neither of these countries could produce iron as cheaply as England. So rapid has been the development of the United States in the ability to mine and prepare iron and steel that experts of authority say this country will surpass Great Britain as a producer of ships before many years have gone by. England owns over 7,310,000 tons of steam merchant marine, which has an annual earning capacity of $500,000,000. The sailing fleet of our cousins across the water brings into the realm of Queen Victoria $130,000,000 every year. Perhaps a clearer understanding of England's position as a sea power can be obtained when it is stated that 56.6 of the world's merchant marine carrying capacity is done by the ships flying the Union Jack.

Some idea of the magnitude of the work necessary in the construction of a great ship can be grasped when it is understood that it is more than a year from the time that the keel of the "Deutschland" was made that the hull of the big liner was ready to be launched. A force of thirty draughtsmen worked on the drawings for this steamer before a stroke of the hammer was heard in the yards of Stettin.

For one year after 1,500 skilled workmen put their entire time on the strips and sheets of steel which finally were united in the form of a ship. The total cost of the "Deutschland" was $3,000,000. Her speed is about twenty-six miles an hour, which is remarkably fast when it is remembered that this rate is frequently maintained for a day at a time. The length of the "Deutschland" is 686½ feet over all; the beam 67 feet, and the depth 44 feet. In displacement this ship registers 16,500 tons, nearly 6,000 tons more than that of either the "St. Paul" or the "St. Louis," the largest liners ever built in the United States.

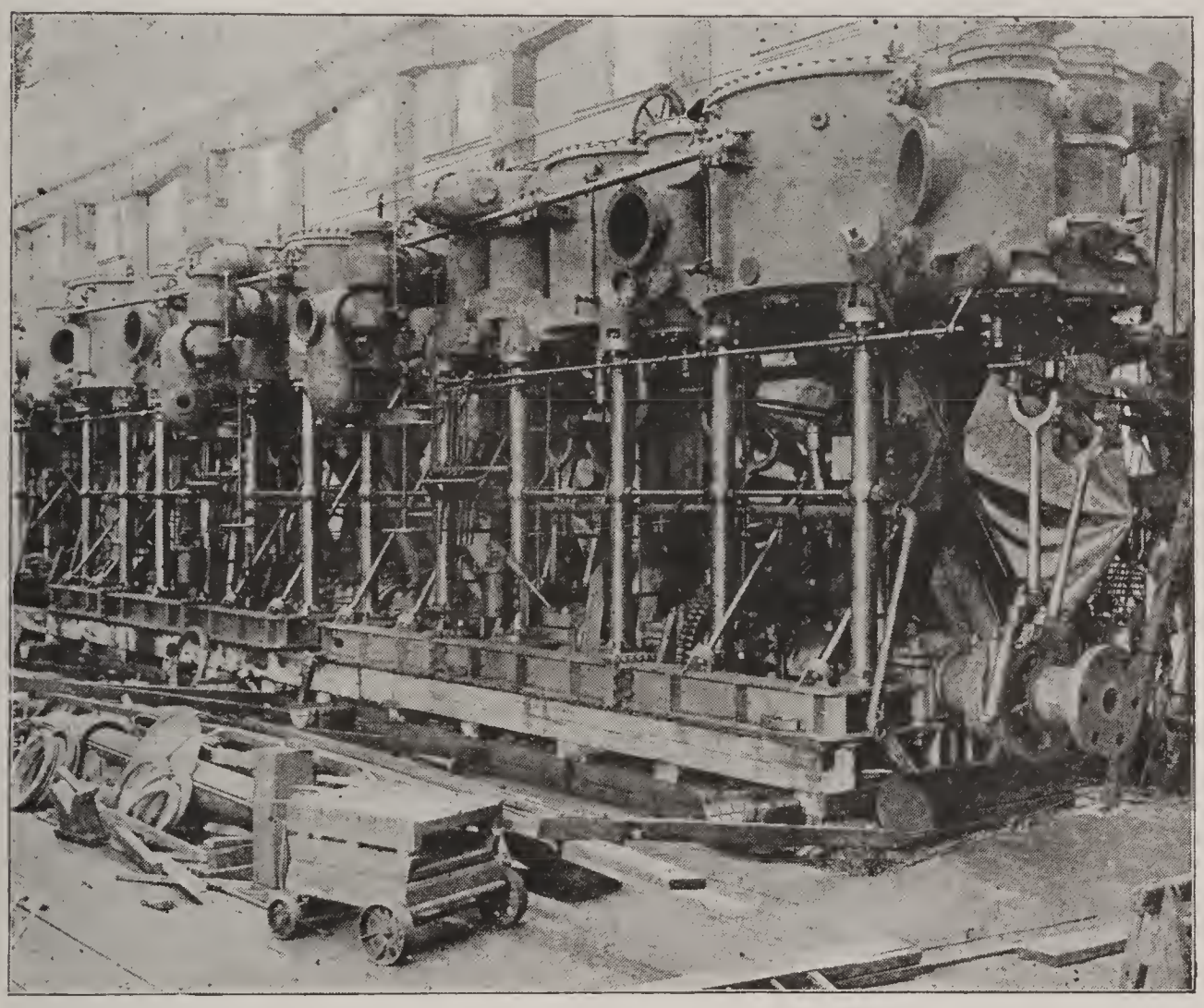
War Ships.

War ships differ in appearance from ocean liners in that they usually have more beam or breadth, and are, for the most part, not much over half as long. This is because the liners are built primarily for speed. The two battleships, "Alabama" and the "Kearsarge," the newest additions to the American navy, were completed and launched in September, 1900. The money spent for the con-

SCENE IN CRAMP'S SHIP-BUILDING YARDS AT PHILADELPHIA.

With two vessels about to be launched. Ships are launched when their keels and hulls are completed.

struction of these fighting machines was something over $11,000,000, which, as is seen, amounts to nearly double the sum which would be required to build two ships of the class of the "Deutschland." Both the "Kearsarge" and the "Alabama" are 368 feet long on the water line, and have 72 feet beams. Their displacement is 11,525 tons, and they speed about nineteen miles an hour. As these two battleships are considered the best afloat, it will be perceived that so far as quality of workmanship is concerned the United States ship builders need fear no competitors.



THE DOUBLE-COMPOUND MAIN DRIVING ENGINES OF THE BATTLESHIP OREGON.

And which brought her from San Francisco to Cuba without accident or delay.

In case a ship fails to make the speed required in the contract, the builders have to pay a penalty of about $100.000 for every mile and an eighth below the total number of miles which the boat is supposed to make inside the hour limit.

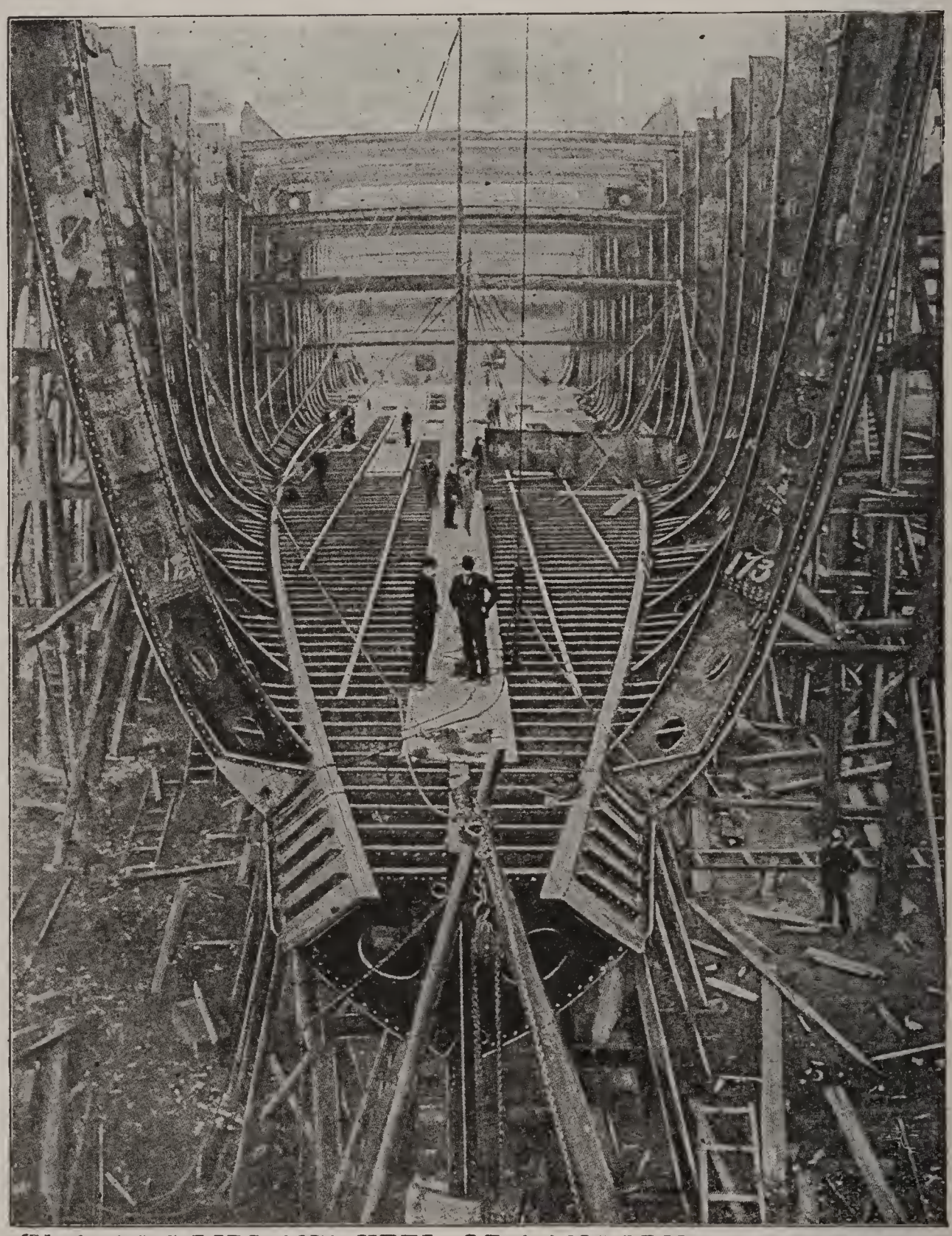
There are two distinct portions of ship building: the theoretical, known as naval architecture; and the practical, called ship building. Every ship must possess certain qualities, the chief of which are buoyancy, stability, speed and handiness. At the same time the nicety of relationship among these requisites must be maintained, as, to some extent, they neutralize one another. Here is where the skill of the naval architect must appear.

In some vessels the greatest possible speed must be attained. An increase of length gives an added displacement of water, and consequently enlarges the carrying power. If this is not the prime desirability finer lines are permitted for and aft, and the speed of the ship is heightened. Increasing the breadth of the beam gives to the ship more stability. Three plans are made by the naval architect. The sheer plan shows all the lines of the length and height; the half-breadth plan indicates the lines of the breadth and height, and the body plan reveals the breadth and height.

How Constructed.

Steel, which is most largely used by ship builders of the nineteenth century is as much superior to iron as is iron to wood. The laying of the lines of the ves

sel is the first step in construction. The keel, made up of several thicknesses of steel, scarped at the ends and riveted together, is placed in position. In the middle or the keel a center plate, which later is carried upward and through the floor of the deck, forms a keelson. On either side of this is a thick bar, and outside all these are put the two lowermost plates of what is known as the "skin," bent downwards. The ribs, in a steel or an iron ship, are termed frames. They are first heated until white, and then bent to the requisite curve. Before fully cooled they are put in place on the keel by a score of workmen with the aid of the riveting machine. To the frames are fastened the floors of the ship. These are narrow plates running across the vessel. Then the beams, which support the decks, are thrown into position and the form of a boat begins to make its appearance.

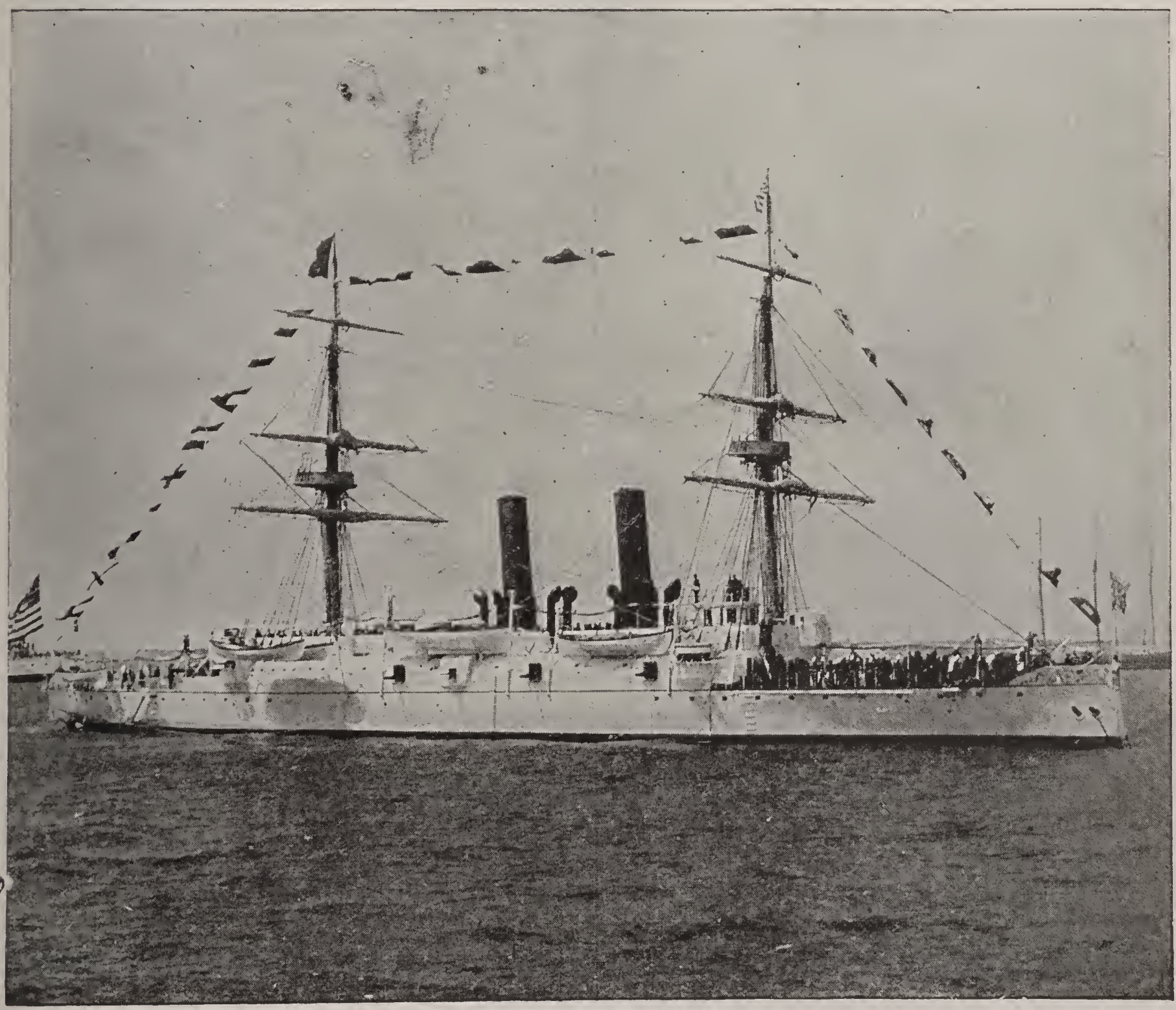


THE IRON RIBS AND KEEL OF A MODERN MAN-OF-WAR IN A SHIP-BUILDING YARD.

After the frames, beams and floors are finished, the putting on of the heavy outer plates commences. When this is at length completed the deck beams are further secured and stiffened by longitudinal and diagonal plates called stringers. No vessel built since 1890 is without the safety appliances which are now considered indispensable. For example, a false bottom, constructed seven or eight feet above the real bottom of the vessel makes the striking of a rock at sea a danger by no means so formidable as in the early days when such a means for protection was unknown. Compartments, so built that the ship can be divided up into twenty-six or more sections, also contribute to the safety of the thousand and more passengers who are housed in an ocean greyhound during a voyage. In

case a fire should break out in any part of the ship, by closing in that particular part of the boat the spreading of the conflagration can invariably be prevented.

The bulkheads, in addition to furnishing the water-tight safety compartments, also lend greater transverse strength to the ship. By the time the external plating is finished it is time for the launching but much yet remains to be done. The greater part of the decks has to be laid; the whole of cabin fittings needs to be put up; the rudder and steering gear require adjusting; the wooden ceiling, which lines the hold, has to be constructed; the masts have to be set, and the rigging strung, and finally the massive engines and the ponderous boilers lowered into the hold and made secure against the pitching and tossing of the ship. With the encouragement given to American ship building since 1898 it is openly predicted that before 1920 no market in the world will have an equal amount of work to do; and when this time arrives England will be forced from the position which she has so long maintained in the shipping industry.



MODERN MAN-OF-WAR.

GREAT ARMOR PLATE

America Produces the Best Steel—Crude Iron Ore Used—What Steel Is The Molding Process—Thickness of Plate.

AMERICA enjoys the distinction of producing the best steel in the world, and in such quantities is it sold abroad that other countries are becoming jealous of her prowess. One of the most wonderful processes in the realm of steel working is that which converts from the crude iron ore just from the mines the monster hundred-ton plates of steel two feet thick, destined to adorn and protect the sides of the great war vessels of the world from the angry missiles of a foe.

When one considers that in 1895 we exported to Great Britain but fifty-nine tons of unwrought steel, and that in 1898 30,000 tons were shipped to that mart, it may be seen how the American industry has grown. At south Bethlehem, Pa., is operated one of the best and greatest plants in the world for producing almost impenetrable armor plate. Here daily are operated engines of science that wield masses of metal of such enormous weight and exert forces of such tremendous power that it would seem that all the giants of mythology were imprisoned here doing the bidding of the quiet men who conduct them. A glance at the method in operation at this plant may be instructive.

What Steel Is.

Steel is the result of a combination of pure iron and carbon. (See article on steel rails.) After the process of blasting has removed all the impurities from the iron, and it is run off into the sand floor to cool into "pigs," some particular system is used to model the huge white-heated ingots into their desired shapes. For tools the system is called the crucible process; in making steel rails the Bessemer process is the one most employed, while in making heavy sheet and plate the open hearth method comes into the foreground.

This last method is employed principally because of the intense heat generated. By it no other enclosure for the pig iron and the other ingredients is needed than the furnace walls. After the iron ore has been reduced to pigs it is

carried, often while still hot, to the open hearths, where mixed with its proper quantity of carbon, generally in the form of scrap steel, it is treated to a heat of 4,000 degrees Fahrenheit. The manner of producing this heat is unique. Coal

flame. The combustion produces a terrific heat, and quickly converts the iron and scraps into flaming steel, with heat thrown off from it seemingly as great as that from the sun.

To carry off the spare gas and hot air

THE GUN-TURNING ROOM OF THE UNITED STATES GOVERNMENT AT WASHINGTON.
Where the final touches are being put on the nation's defenders.

having been treated to a great heat in air-tight ovens with but a limited supply of air gives of an intensely hot gas. This gas is passed through firebrick passages that open over the hearth where the iron and steel are awaiting it. Here a full supply of air greets it and it bursts into

another firebrick passage is arranged opposite the one which originally conducted the gas to the hearth. The escape of such an amount of intense heat of course warms up the escape passage to a rather tropical condition. Every twenty minutes to save heat these passages are

reversed and the gas generated in the ovens is now brought out to the hearth through the already heated passage that a few moments took away the escaping heat. This method saves a great amount of heat, and is one of the great principles of open hearth heating. At the Bethlehem works there are eight of these great heating hearths, four capable of accommodating forty tons of metal each, and the other four twenty tons each.

Molding Process.

After the heating has gone far enough the steel is run off into huge caldrons running on rails, and is thence ladled off into molds that also run along tracks. The method of pouring into these molds is peculiar in that it does not splash the steel, but rather gently runs it into a side tube which allows the mold to fill up slowly from the bottom. This "bottom filling" process does away almost entirely with the uneven qualities of steel produced by old methods. As a further guard against bubbles and escaping gas and air the inner sides of the molds are constructed with a kind of metal lathwork covered with sand, which allows the escape from the hardening steel without marring its grain. The process of hardening differs from the old style hammering, for such a method is likely to create flaws. The process used at Bethlehem is what is known as "fluid compression," which by hydraulic presses exerts a pressure of seven thousand tons while the metal is still in molten form. These tremendous ingots from which immense guns or crank-shafts for steamships are made often weigh as much as 120 tons, and take days to cool off.

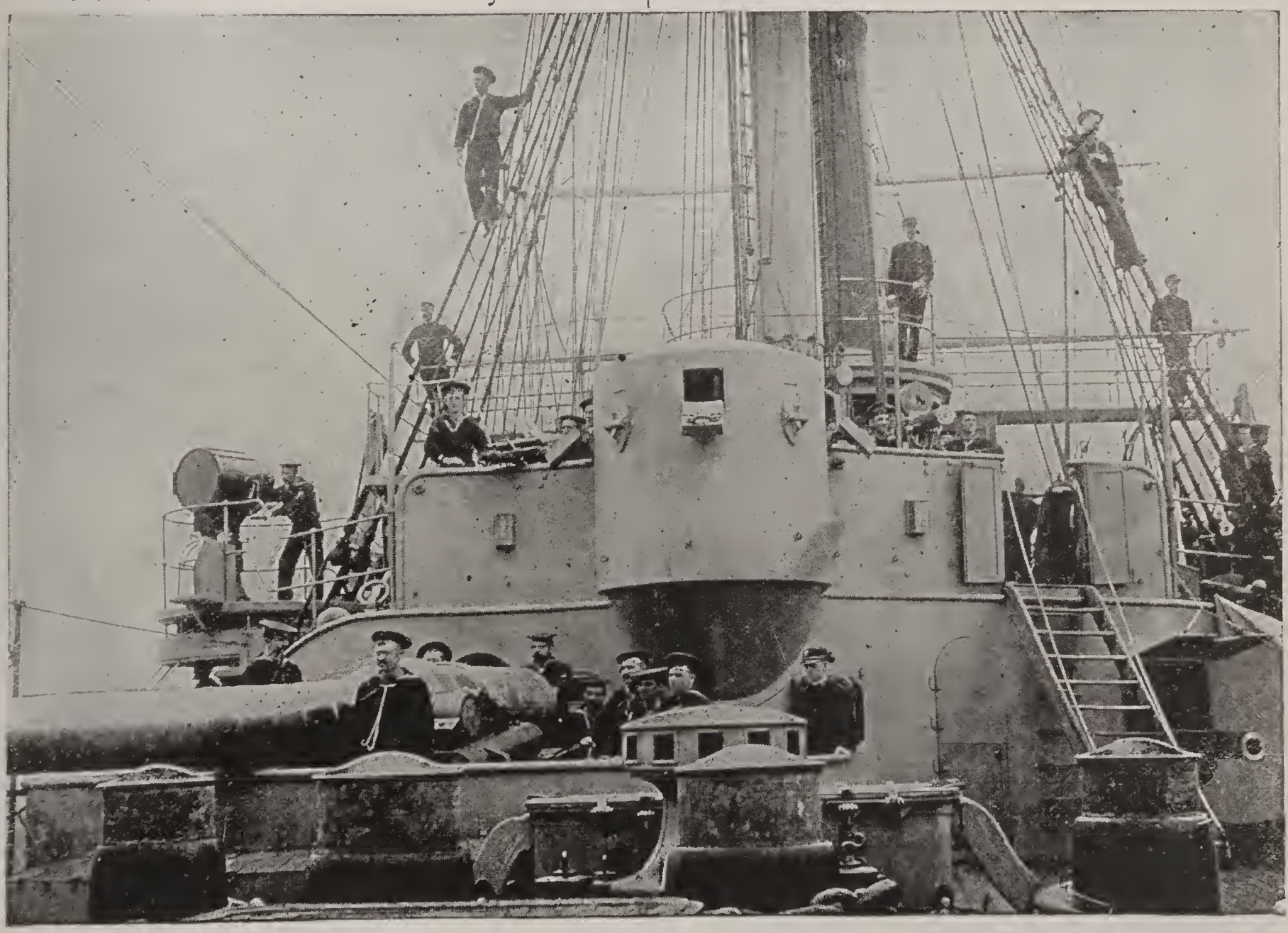
After an ingot has cooled off sufficiently to handle, the great traveling cranes pick it up and take it to a furnace where it is heated over again to a temperature of 1,200 to 1,500 degrees. The ingot is here likely to crack if not reheated just in the proper manner, so great care must be used in its handling. The enormous cranes that carry it about weigh themselves something like 175 tons each, and the engine that operates them exerts the power of 1,500 horses. After the reheating process the ingot is again treated to the hydraulic press for shaping, but this time the pressure is that of 28,000,000 pounds. This method of tempering is vastly better than the old hammer method, for formerly when great castings were manipulated by hammering, the effect of the pressure would not be felt far enough below the surface, and only the case would be hardened sufficiently to withstand the strain on it from usage as armor plating, gun barrels, or crankshafts.

Preventing Cracks.

To prevent any cracks or inequalities, therefore, in the steel, the reheating and hydraulic pressing process is repeated several times, and at last a final heat treatment called annealing may be given, or in the case of a crank-shaft it may suddenly be dropped into a tank of oil, which prevents crystalizing, and is called oil tempering. One would think that after this last treatment of tempering the steel would be rather unwieldy for trimming or paring into shape, but science has overcome these great difficulties, and great buzz saws eighty-four inches in diameter and with seventy-six inserted teeth can saw in two a plate thirty-three feet long and two feet thick. Lathes are also employed that will take a great blank of steel destined to become one of the navy's big guns and pare it and shave it down to its proper size. In making armor plates after the tempering has

gone on to a certain degree the plates are hustled over to great hydraulic presses that straighten them out and prevent warping Others are taken to other presses that exert a tremendous pressure, and bend them up into shape to fit the vessel for which they are intended.

After the plates have been finished they must be tested to see that they are suitable for service in the navy. All the time the operation has been going on, government officers have been examining the process and the material. Now they select what they believe to be the poorest specimen produced and take it to the testing ground for a practical test. It is propped up with timbers, and at a certain distance from it cannons are placed which fire point blank their charges of steel balls into the new armor. Some of the missiles only scratch the plate, others dent it, and still others go clear through. If the plate is worthy of use and stands the test, the whole batch that has been made is received by the government. If not the next poorest plate is subjected to the test, and if it meets a like fate the whole batch is condemned, the cost of the manufacture is met by the contractor, and a new set must be made. The styles of armor plate most successful have been those invented by Harvey and Krupp, though the latter is now ahead in protective qualities. Its surface, strange to say, is full of little cracks and seams, but the makers and government experts know that beneath lies a strength almost impenetrable, and dare not tamper with it beyond giving the simple coat of paint that adorns the ships of the world's navies.



SECTION OF ARMOR PLATED U. S. CRUISER

TEA GROWING

Can be Raised in the United States—Difficulties to be Overcome—Cost of Home Labor—Tea Farming in South Carolina

THERE is but one tea plantation in the United States. That is at Summerville, S. C., and it is the property of Dr. Charles U. Shepard. Here has been demonstrated the fact that it is possible and practicable to raise tea leaf in this country. According to Dr. Shepard, the cultivation of the tea plant, with a little economy, can be made a profitable industry, and he predicts that in time the United States will no longer be dependent upon the Orient for the means wherewith to make one of the most common American drinks. This tea plantation was first tried merely as an experiment. Seed was brought from the famous tea gardens of China and Japan. The authorities at Washington heard of the efforts to introduce the plant, and a commissioner was sent to investigate the matter. He made a favorable report. Dr. Shepard claims that his plants produce more leaves annually than do those in either of the countries from which the seed was brought. The products of the garden have always found a ready sale and command prices equal to that demanded for excellent brands of Oriental tea.

The crop in 1899 amounted to eleven hundred pounds, but much more is ex-

TEA PICKERS OF CEYLON.

Working on the plantation gathering the green leaves for drying and preparation.

pected of future seasons. The most important things to be considered in growing the plant in this country are the price of labor and the yield per plant. In America it costs as much per pound almost to pick the fresh leaf, owing to expensive labor, as it does in the Orient for the raising, picking and packing of the same amount. The problems facing the American tea planter are two: he must either cultivate a much better brand than that imported, or he must materially reduce the expense of labor. In fitting out a plantation a well-equipped factory is indispensable. The leaves must be spread out to dry, rolled, and be oxidized; all of which require machinery and space. The total cost of maintaining a factory capable of producing fifty pounds of dried tea daily may be estimated from fifteen hundred to two thousand dollars annually.

CHINESE WINNOWING TEA.

Somewhat like our old method of fanning wheat, with the exception of the youthful feeder.

THE WORLD'S WHEAT.

The Cry for Bread—Annual Wheat Supply—One Barrel of Flour for Each Human—Danger of Lack of Supply—When Wheat Ripens.

EUROPE feeds off America, and off wheat at that, for though Europe raised in 1898 1,548,881,000 bushels of wheat to America's 758,000,000, her nations eat so much more bread proportionately that ere the year is half gone she cries to us for food. Not only is it Europe we supply, but the frugal Chinaman, who, having tasted our wheat bread, calls it good, and is wont to forsake his rice and chopsticks for it.

In round numbers, there are to-day 517,000,000 bread eaters in the world. Each year there is added to this number nearly eight millions of people who clamor for bread. Part of these come from increase through new births; more are added by cultivating a taste for wheat. The average wheat flour consumed by each person through the year is about one barrel, or four and one-half bushels of wheat. Americans eat a little more than this average, while the Frenchman and Briton eat still more, and the Russian and German less. At an estimate, then, the bread-eating world requires each year over 2,300,000,000 bushels of wheat to supply its table with bread. In 1897 the crop fell short of this mark by nearly a million bushels, creating high prices in the less fortunate lands, and even causing famine in India. With some fear, it is viewed by scientists like Sir William Crookes that by the year 1931 the world will be crying for more bread than can be supplied by the farms of the entire globe. To show to what an extent nations depend upon the wheat-raising countries, England, whose population consumes her entire crop in thirteen weeks, must needs be supplied for the rest of the year from America, Russia or India, or else die of starvation. In time of war if the United Kingdom were blockaded for three months the whole country would be depopulated. The nations must live on wheat, and to procure it all things possible are done.

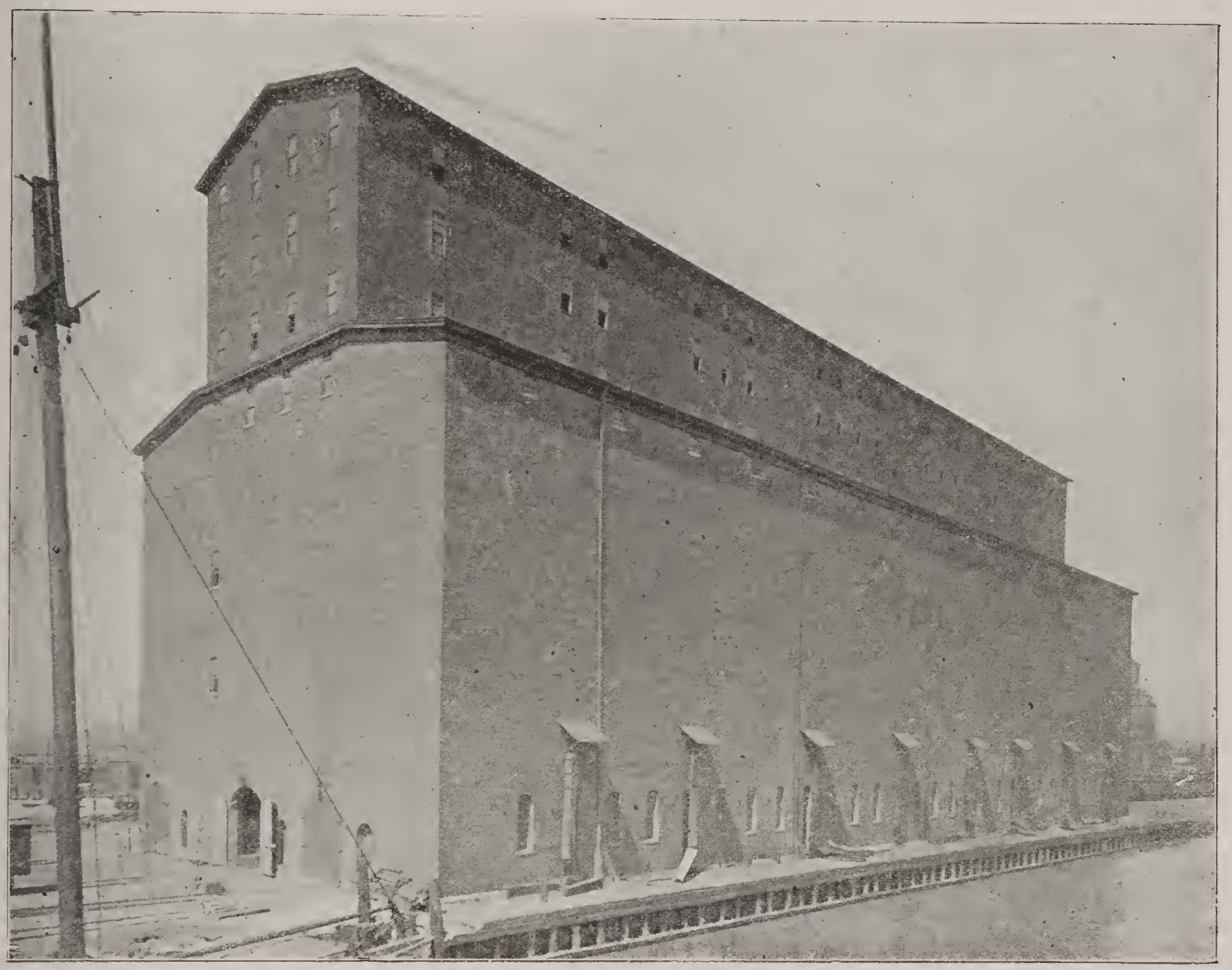
Tide of Wheat.

The tide of wheat traffic flows principally from west to east, and from south to north. There are a few exceptions to this, as where America ships to Brazil and China, and Russia and India ship to England and the rest of Europe, but in the main the great traffic is across the Atlantic. The American, while a great bread eater, does not quite forsake his potatoes, and consequently sends his surplus wheat where he can get the best prices. Gigantic as are American projects in general, the calling of the wheat trader commands the admiration of all. The life of the American public depends on the livelihood of the American farmer. When crops are good general business conditions are buoyant. The man who buys and sells wheat for his vocation

deals in such enormou[s] fortunes and with such quantities of the life of nations that the world at large almost bows down to him.

Both the farmer and the trader keep informed as to the exact condition of the markets the world over, and so far has civilization and business instinct entered into the work of the former that he has even had telephones put upon his farms, enabling him at once to learn the exact spot where he can sell his product at the highest price.

So great are the transactions daily in this commodity that the dealers on the boards of trade when they sell "10 wheat" mean 10,000 bushels, and not merely ten bushels. In spite of his great eagerness to dispose of his stock, he never sells down below a certain huge surplus. For instance, July 1, 1899, the "visible supply" in the great terminal elevators at Chicago, Duluth, and Minneapolis together with wheat in transit measured 74,000,000 bushels. The invisible supply in the hands of the farmer roughly estimated was 70,000,000, making a total of such proportions that it is easily explained how a Leiter could not "corner" the wheat market.



A CHICAGO GRAIN ELEVATOR,

On the banks of the Chicago River, one of the largest of its kind in the world, capacity 700,000 bushels. The grain stored is shipped to Europe.

When Wheat Ripens.

Let us follow the movements of this cereal from the harvests to the consumer. At the bottom of the world in Peru and the south of Africa along in November the wheat begins to ripen for its cutting. In December follows the harvest in Burma; in January, Australia and Argentine; in February and March, the East Indies and Upper Egypt; in April, the wheat belt of Asia Minor, Persia, India and Mexico. About May wheat begins to ripen in the lower part of the United States, Japan and northern Africa. When June comes our great harvest begins in earnest, and continues until the last wheat of the Red River Valley is gathered along about the first of September. With this march of the harvests goes the migration of the harvesting hands. Early in the spring he appears unkempt and poverty-stricken, ready to do a man's full work for double wages. And he gets the wage, too, and then disappears to spend it, reappearing the next spring to resume the old task. It is estimated that his tribe numbers at least 50,000 men. This army by means of the latest improved methods of harvesting, reaps, binds, thrashes, and stores up the wheat for sale to the elevator men.

A SCENE ON THE CHICAGO RIVER,

Where grain boats destined for Buffalo are taking on loads for carriage across the Great Lakes.

The primary movement of wheat is toward the local flour mill, where it is ground up to supply the farmer's family, and toward the granary, where it is stored up for the next planting supply. In the States where the crops are not large the supply is consumed almost entirely at

home, and in many States not so much as a kernel gets away to supply other peoples. When the farmer gets all he wants for himself he begins to think of making a profit. This selling surplus in 1898 amounted to 400,000,000 bushels. Of this something less than half is consumed in our cities, while the rest goes abroad either as wheat or flour. There are three general methods for selling this surplus.

INSPECTORS AT A CAR OF GRAIN WHICH THEY ARE TO GRADE.

The farmer who owns acres in the thousands and who can afford from two to ten thrashing machines often maintains one or two elevators on his ground, where he can store his supply until the time when he can dispose of it at a good price. Such men who do business on the wholesale plan often make as high as $30,000 net yearly. Then there is the class of farmers who, though less extensive growers, keep a close acquaintance with the commission men in the great trading centers, and order cars for themselves, shipping their grain direct to the dealers who pay the highest figures. Often they are so enterprising that they sell on the boards for future delivery.

How Farmers Sell.

The great mass of farmers, however, still sell in the old-fashioned way to the local elevator men. To be sure, they keep thoroughly informed on market quotations and sell accordingly, and if prices at the local buyer's hands do not suit him he combines with his neighbors and emulating his larger brothers ships direct to Minneapolis, Duluth or Chicago. The elevator companies at the great centers control warehouses along all railroads, and on water lines throughout the wheat growing districts, and so great is the demand for the commodity that as soon as a local elevator secures a new supply it is telegraphed to the headquarters at the trade center, and is almost as soon disposed of. So rapid is this operation that two-thirds of the year's supply is generally sold before the year is half over.

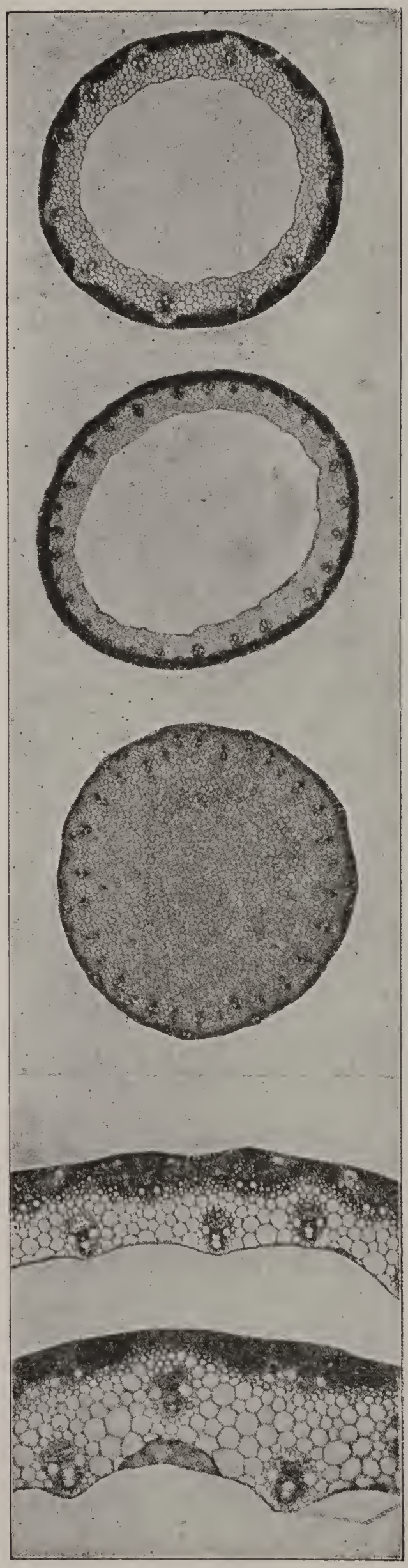
System of Grading.

Perhaps no other one thing so facilitates in the movement of wheat as the system of grading. Time was when every prospective buyer had to inspect each load of wheat for himself, and the business of

trading was full of time-consuming details. Lately, however, the state governments or local boards of trade and chambers of commerce have stepped in and superintended the grading, so that wheat may now be bought safely with the assurance it is of a certain uniform quality. In Minneapolis, which is the largest primary wheat center of the world, this system has reached its perfection. It is controlled by the State Railroad and Warehouse Commission, and meets every August in St. Paul for the purpose of establishing grades for the next year. Grain men from everywhere are invited to be present and make suggestions. In 1899 there were eighteen grades, of which the following were the first two: No. 1, Hard Spring Wheat, which must be sound, bright and well cleaned, and must be composed mostly of hard Scotch Fife, and weigh not less than fifty-eight pounds to the measured bushel: No. 1 Northern Spring Wheat, which must be sound and well cleaned, and must be composed of the hard and soft varieties of spring wheat.

Grain Inspection.

Early in the morning the deputy inspector and his assistants start out to the side-tracked cars full of wheat for their marketward trip. One man goes ahead and records the initials and number of the car, and sees that no one has tampered with the seals. Then comes another who breaks the seal, and then the inspector who delves into the wheat and by sniffing here and taking a pinch there grades its quality. Sometimes he plunges a long hollow tube into the wheat to see that no "sharper" trader has put in a layer of poorer quality. Sometimes he finds it necessary to weigh a quantity in his little brass kettle to see that it comes strictly



After building up the ear, or head of grain, it is necessary to build up a straw capable of supporting the increased ears. The top photograph exhibits a transverse section of the original variety of straw. The outer rim is practically solid to resist the influence of the weather. The inner substance is a mass of cells acting as stays and giving it the necessary strength. The dark bundles near the outer rim are a series of helical springs. These helical springs enable the straw to bend without breaking. The second illustration shows the number of these helical springs increased. The third shows a further increase in these helical springs with interior cells increased so much as to fill up the hollow stem. At the extreme bottom are sections of 1 and 2 magnified to a greater extent.

up to the law. Generally, however, they are so expert that the quality can be told by the mere handling. And the system is honest, for the inspectors do not know whose grain they are inspecting until after it is all done.

Besides this the process includes filling little bags with samples from each car

The wheat ear in the center shows the grain before cultivation, only half of the head containing grains, and those small in size, as shown immediately below the ear. The wheat ears or heads on either side show the grain after artificial cross fertilization. This operation necessitates the opening of the case and the removal of the pollen while in an immature state. Later the pollen must be procured from the species with which the cross fertilization is desired and placed in the pistils of the species first operated upon.

and sealing them with their respective initials and numbers for shipment to the chamber of commerce, where set out in little tin trays they form the basis for the next morning's trading. After the inspector has finished his work the cars are re-sealed by the State to await the disposition of the purchaser. Records are kept by the State until the grain in question has passed out of the market. It sometimes happens that a commission man thinks that the grain sent to him is of higher grade than that given it by the inspector. In that event, if he so wishes, he may have it inspected again by the State board, which, if the grade has been incorrect, pays the expense for re-examination; otherwise the trader must stand it. In 1898, of 220,777 cars inspected in the State of Minnesota, only 16,104 were complained of, and only half this number were incorrectly inspected.

In the wheat pits of the boards of trade is done the greater part of the transactions that send the supply all over the world. Here about ten o'clock in the morning, after the samples have been received from the cars, traders, millers and elevator men swarm about the tables arranging deals for delivery of millions of bushels of wheat. Dials on the walls indicate the fluctuations in price according to sales in other cities. A miller wishes so much wheat at a certain figure; it is sold, an easy transaction. But further than this and what has brought the boards of the world into disrepute, is the custom of selling for "future delivery."

Trading in the Sixties.

Back in the sixties, when transportation was difficult, traders up in northern Minnesota had to buy wheat in the fall, store it all winter, and then ship it down the Mississippi in the spring, without the

least idea of what price it would bring. The traders had to buy at a low figure, and stood equal chances of losing or gaining enormously. From this grew the custom of selling for future delivery wheat that was then on hand. This in itself was businesslike enough, but from it has grown the future sales of wheat by men that never have the possession of it nor who ever expect to have, simply a vast system of speculation. Yet it is one that has its conveniences, for it creates markets, and facilitates the swift movement of wheat without the exorbitant costs of grasping middlemen.

After the wheat has been sold, elevator certificates are given for its delivery. These receipts are accepted by banks on loans for almost their face value, and naturally both the banks and State watch the elevators to see that absolute trustworthiness prevails. The great elevator centers of the United States are Minneapolis, Duluth, Chicago and Buffalo. These great steel buildings fitted with every facility for storing, cleaning, drying and scouring wheat and other grain hold from 1,000,000 to 2,500,000 bushels. Great spouts called "legs," through which run moving bucket-belts, are pushed down into the holds of ships or into cars, and the grain is rapidly sucked up into its proper bins. In the holds of vessels gangs of men stand knee-deep in the wheat and shovel it in front of big shovel plows run by steam, which in turn dump the grain into the "legs" for carrying upwards. A cargo of 180,000 bushels can thus be unloaded in a few hours, and when it is considered that at the same time "legs" from the opposite side of the elevator may be re-shipping the grain into cars ready for the seaboard, the magnitude of the operation may be apparent. And all this is done for about one cent a bushel.

Wheat Goes East.

Directly resulting from the storing of the grain in the great elevators pending sale and shipment comes the growth of the great eastern movement of wheat in the United States and the added millions in revenue to the great steamship and railroad companies. Lake transportation is the cheaper for grain, and costs but three-quarters of a mill per ton per mile. Situated as all the elevators are, very near the lakes, the business of transportation of wheat has grown to enormous proportions. Grain shipped by cars to Chicago and Duluth, and by river to Minneapolis finally reaches in most instances the elevators at Buffalo, where, either by rail or canal, it is re-shipped to the seaboard, thence to find its way to Europe. The cost of the transportation of one bushel of wheat from Minneapolis, including three reshipments at Duluth, Buffalo and New York, to almost any point in western Europe is but twenty cents. It is curious that it costs almost as much to transport the same from the Dakota wheat fields to Duluth alone.

And what of the profits accruing from this great wheat industry to the people of America? From about 4,000,000 barrels of flour shipped abroad in 1875, our trade has grown to nearly 20,000,000 barrels. American flour is shipped 5,000 miles to compete with Russian flour, and even the Chinaman is now gladly using our poorer grades. In ten years our flour trade with Japan has increased elevenfold. The total foreign sales for 1899 were $177,000,000, of which Great Britain took $100,000,000 worth. The farmer is growing prosperous under this great production. His estimated gains run from 5 to 12 per cent of his invested capital, and with all the modern improvements and facilities his enormous yearly crop receipts average nearly $400,000,000.

MAKING FLOUR.

Vast Gain Made in Modern Mills—The Stones that Are Used—Experts Studying the Problem—Largest Mills Are in the United States—English Methods.

VAST changes have entered into methods of flour milling since the days when two heavy stones were used by hand to crush the flour from the wheat. In 1900 the machinery employed in the largest mills and the best in the world, viz., those in Minneapolis, Minn., is far in advance of the kind used ten years previous. Experts are continually at work devising contrivances which will lessen the cost of grinding flour and at the same time act in a beneficial way upon the finished product.

In ancient times wheat was placed between a large convex and an equally large concave stone, which fitted into each other in a sort of crude fashion. A strong pair of arms then supplied the power which crushed the flour out of the wheat, but the process was slow and arduous The first real step in the direction of progress came with the introduction of the quern, which is still used in the Shetland Isles, the Faröes and in some other places. The main difference between the quern and the more modern mill stones is in the size of the upper stone, which now is made larger to permit the turning to be done by water, wind or steam power. Again, the more modern mill stones were, for the most part, made from buhr stone, a sort of silica much like flint in point of hardness, but not so brittle.

THE PILLSBURY FLOUR MILLS AND ELEVATORS AT MINNEAPOLIS, MINN.

The largest plant of its kind in the world and operated by steam and water power.

Mill Stones.

The usual size of a mill stone is four or six feet in diameter. It is made up of a number of pieces of the material, strongly cemented, and then bound together with iron hoops. The grinding surface of the mill stone is grooved. These grooves are cut perpendicular on one side, and with a slant on the other.

Power is communicated to the upper mill stone by means of shafting which is at the end of a spur wheel. The lower mill stone remains stationary, and the grain, poured into a hole in the top of the upper stone, comes between the two and is ground into flour or meal by a force called centrifugal. The finished product passes from the enclosed mill stones down through a spout into what is called the worm, which cools the flour or the meal while carrying it along to the elevators. The elevators raise the product to the silk dressing machines.

This machine is really nothing more than a cylinder. Prior to 1885 it was usually made of wire cloth of several degrees of fineness, thus separating the flour into a variety of qualities, the finest passing through the first portion in the cylinder, the next finest through the second, and so on; no part of any of the screens being fine enough to let through the bran, which passed out from the end of the cylinder. Hoppers were placed below the dressing machine—and are used to this day in some mills—and with their aid the flour and bran are run into sacks.

English Methods.

Some of the large English mills are driven by steam engines, and though they are far ahead of the mills of 1850, they are, in many respects, several degrees behind the more enterprising American methods. In the best English mills the wheat passes through a series of cleaning machines—rapidly revolving beaters inside an iron case—and then through winnowing machines. After being slightly crushed by iron rollers and passed through a sifting machine, the wheat is finally crushed between from thirty to fifty pairs of mill stones.

It is then sifted through silk cylinders; first to separate the bran and then the middlings. Such a mill will produce 1,000 sacks of flour in a single day. Despite this large quantity the best American mills, with the most modern improvements and with a larger capacity, will quadruple this amount, and even do still better under pressure. Among the most valuable improvements of importance since 1875 is the high grinding system which is in use in all the foremost mills in America.

Some Modern Improvements.

This does away with mill stones, and brings into operation rollers, either porcelain or chilled iron, which are more suited to the hard wheats. As a result, the wheat produced is of a finer quality. The method originated in Hungary, which has long led the continent in the production of flour. The middling purifier is another important factor in modern milling methods. The principle is a series of horizontal sieves kept constantly in motion, through which passes a current of air driven by a fan. Following this the middlings, after being put through the purifier, are ground by porcelain rollers and dressed through silk, after the manner of ground wheat. These middling purifiers are the leading feature in America, which no longer knows the mill by the side of a convenient stream of water. A few such are left, but they stand for sentiment and not for progress.

ELECTION OF POPES.

Manner of Choosing a Pontiff—The Rules Followed After a Death—How the Cardinals Meet and Vote—Singular Ceremonies.

ONE of the greatest elections in the world and one which interests all classes is the election of the Pope of the Roman Catholic Church. From the year 1 A. D., when St. Peter was the recognized head of the Roman church, until February 20, 1878, 261 popes were elected. In the early days the custom was to call a meeting of cardinals to elect a successor to the dead Pope in the Lateran or the Vatican basilica, or in the cathedral of any city in which they might have determined to hold the election. The old mode of procedure in papal election was abolished in 1247, when the rules and regulations of the conclave were settled. These still exist, and form the bulwark of the present system.

In 1247 Gregory X., who was similarly elected, called a conference of the great ecclesiastics with the object of establishing permanently the manner of electing the Roman Pontiff. A constitution was there drawn up and approved by the fathers. According to this constitution the cardinals shall celebrate the death of the Pope for nine days, and on the tenth shall come together for the purpose of electing his successor. They shall be accompanied by a single attendant, lay or clerical, or at most, in case of evident necessity, by two attendants. The conclave shall be held in the palace of the late Pope, and the cardinals

THE CATHEDRAL OF MILAN.

One of the great Catholic churches of Europe, at Milan, Italy. The building was begun in 1387 and its extreme height is 355 feet.

must live in common, occupying one large room. One room, however, is reserved for private purposes. While in conference no person shall be allowed to converse with a cardinal, and communication may be had with only such outsiders as are called before the body to discuss matters germane to the subject. No letters or message may be sent under pain of excommunication.

If after three days the cardinals fail to agree, they shall be allowed but one dish of food at dinner and supper during the next five days. After that only bread and water will be given them until an agreement is reached. Nothing shall be taken from the coffers of the vatican while no Pope is in office. Nothing but the election shall be treated unless the temporalities of the Holy See are threatened. If any cardinal attempts to entice his brethren to his own side by offering a bribe, he shall suffer excommunication Two-thirds of the votes of all present are necessary for an election. Voting by proxy is not recognized, but a cardinal may enter the conclave after it goes in session if he be detained on his journey. Any one, not a woman, a manifest heretic or an infidel, is eligible to the papacy.

GERMAN DUELS.

Students Fight for Glory—Give Each Other Many Scars—Battles that Last for Hours—Usually Fought in an Inn.

THE duels of German students have become famous throughout the world. Instead of turning to football and other athletics, these seekers of knowledge delight in broadsword dueling and exchanging wounds which leave scars on the faces of many for life. The practice is very common, and especially in the southern parts of Germany but little opposition is offered to the so-called sport.

Clubs, corresponding in a way to the Greek letter fraternities in American universities, are the organizations which support the practice. It is under the auspices of these that the tournaments and duels are held. It is as honorable for a student to have his face covered with scars in that country as it is for an American student to be covered with honors of the football field. Many of Germany's most learned men are thus marked, and in many instances professors countenance the "play."

The duels usually come off in a drinking house. The landlord in an out-of-the-way place provides a room, the floor of which is covered with sawdust. The contestants for honors assemble here and don a tough jacket and guard, which is placed on the right arm. This is used not only to protect the arm, but also to parry blows. The seconds and friends of the duelists then gather about the room, and the fight is on. They slash and cut at one another with all the skill which comes from long practice with the sword. Sometimes the fight continues for hours.

as blood has been drawn on neither side. The face is the objective point in all attacks. If a slight wound is given one of the duelists, a halt is called until the attending physician examines the cut. Unless he thinks it sufficiently serious or that it will leave a big scar, the fighting continues as before, although blood flows profusely.

When the men are almost exhausted they become careless. Then it is that a chance blow decides the battle. When a good gash is made a final halt is called. The wounded student is put under the care of a physician, and the audience withdraws with the victor. Next day the wounded student, if he is able, appears as usual at his classes, with great strips of sticking plaster on his face. He is the hero of the hour, and is welcomed everywhere. These clubs often have tournaments in which all present participate. After one of these battles royal there is not a popular student in the school who does not bear some mark of the fray when he presents himself at his classes the following day.

THE MUSK OX.

Raising the Ox for its Fleece—Two Calves are Captured—The Herd in Sweden Now—Weight of the Fleece.

IN Sweden the industry of raising the musk ox for its fleece has been started on a large scale. After making many unsuccessful attempts the Kolkhoff Artic Expedition, which several seasons ago returned to Sweden from Greenland, succeeded in there capturing alive two calves of the musk ox, a male and a female, and in bringing them to Sweden in good condition. In this way the musk ox industry started.

At present there is a large herd of these animals, which are being cared for on a farm in northern Sweden, where all conditions are apparently suitable for their development. The musk ox (Ovibos moschatus) is a singular animal resembling both an ox and a sheep, as the scientific name "ovibos" implies. Its introduction into Sweden will be of great benefit to that country in the opinion of Kolkhoff, who, in flat contradiction to the statements of other zoologists, says that the flesh of the animal is not merely edible, but of very agreeable flavor. As a fully-developed musk ox weighs about 1,500 pounds, this is an important consideration.

But the principal value of the animal lies in its heavy fleece of dark brown wool of extraordinarily strong fiber. The fleece of a single musk ox outweighs those of twenty sheep.

MAUNA LOA.

Remarkable Group of Hawaiian Volcanoes—Their Destructive Power—Size of Craters—Enormous Flow of Lava—Eruptions of the Past.

ON the island of Hawaii there is a remarkable group of mountain peaks and volcanoes, originally constructed by hot matter hurled from the bowels of the earth into the ocean depths and then by successive eruptions built upward until the caps and craters of Mauna Loa, Mauna Kea, Hualalai, Kohala, Kilauea and Kulania rose above the waters and became at their visible bases habitable land.

Of this group Mauna Loa, an active volcano, has been in a state of perturbation for some time, indicating that an overflow was pending with accompanying tidal waves and earthquakes. When the steamship Australia left Honolulu in July, 1899, evidence was at hand that Mauna Loa was engaged in destroying herself. The lava flow was within ten miles of Hilo, the sky was overcast with clouds charged with gas, the sea was much perturbed, and sulphur smoke filled the air for miles beyond the shore lines.

On July 22, 1899, there was a severe earthquake shock in southern California, and at practically the same time a tidal wave in Lake Superior, neither easily explained unless it is assumed, until scientific explanation may be had, that way down in the interior of the earth there

THIS IS A CIGAR FACTORY IN MANILA, THE PHILIPPINES

Natives are employed exclusively and make a cigar now coming to this country.

might be found sharp traces of a seismic wave extending from boiling Mauna Loa to the uttermost parts of the earth and producing at Los Angeles and in Lake Superior the phenomena which troubled the people.

Mother Earth is as travail as she wills, and where her upper crust may be thin she finds a vent for her inward commotions, and the result at unexpected moments is an earthquake, a tidal wave, a destroying flow of lava. It is within the range of possibilities that, constructed as it has been by volcanic action, Hawaii—one of Uncle Sam's latest possessions—may be effaced from the map, sink back into the depths from which it came, and Mauna Loa and Kilauea become but names on the pages of natural history.

A GAME DINNER IN HAWAII.

The guests wearing garlands of flowers, a beautiful native custom.

Island of Volcanoes.

The Hawaiian or Sandwich group of islands consists of a chain of islands, reefs and banks running nearly 2,000 miles in the direction from northwest to southeast. The highest volcanoes and vastest caldrons of seething lavas are found in Hawaii, the largest member of the group, at its southeastern extremity. In Hawaii, the volcano of Mauna Loa, or the Great Mountain, rises to a height of 13,760 feet, or about 3,000 feet above the vegetable zone. Her crater is in reality a group of craters, known in the native tongue as Mokuaveoveo. They open on the very summit of the mountain, forming a symmetrical cavity. In the center of this cavity is the vast primitive or mother crater, with a mean diameter of 6,000 feet, and a depth of over 1,000 feet.

Offspring of Mauna Loa is the vast lateral crater of Kilauea, which opens on the east flank of its parent. Northwest of Mauna Loa is Mauna Hualali, occasionally active. Still farther on is Mauna Kea, 13,850 feet in height, extinct and snow-capped. All volcanic eruptions of any importance in Hawaii are now confined to Mauna Loa and Kilauea, and it is around them that interest centers in view of the startling tremblings of the earth and the fear that Hawaii itself is doomed to a terrible visitation.

Destruction Predicted.

The natives of Hawaii have invested their volcanoes with fables and legends, have built up about them a mass of romance in which truth and imagination

are so interblended that separation is impossible. If Mauna Loa finally overwhelms the island it will be no more than the natives say she has intended doing for some centuries past. These natives believe that Hawaii was formed by the bursting of a huge egg in midocean, one of the fragments of which became the beautiful isle from which rises the flame-kissed crest of Mauna Loa. The authentic part of the egg story is that past eruptions have created new lands in the Hawaiian group and formed the basis for it.

The legend tellers go on to say that after the bursting of the egg and the uprising of Mauna Loa something or other was done by the first inhabitants to offend the volcano and bring from it the threat that in punishment Hawaii should eventually be returned to the depths in which the egg first took form. Time and time again the lava has poured from the lips of Mauna Loa down onto the villages and fields, and almost but not quite carried out the vengeance. After each outburst of wrath the natives, on finding themselves and the island still in existence, express delight, but with a shake of the head say:

"Next time, ah!"

Gigantic Proportions.

The gigantic proportions of Mauna Loa and companion craters leave no room for doubt that they form one of the principal vents of the earth through which gases and molten matter are hurled out from the interior to the surface. Here are the proportions of the crater of Mauna Loa:

Area, 3.70 square miles, or 2,370 acres.

Circumference, 50,000 feet, or 9.47 miles.

Length, 19,500 feet, or 3.7 miles.

Width, 9,200 feet, or 1.74 miles.

Elevation, 13,760 feet.

These dimensions of Mauna Loa are simply those of the summit crater. The dimensions of Kilauea, the offspring, are:

Area, 4.14 miles, or 2,650 acres.

Circumference, 41,500 feet, or 7.85 miles.

Extreme width, 10,300 feet, or 1.95 miles.

Extreme length, 15,500 feet, or 2.93 miles.

If these proportions are considered extraordinary, what is to be thought of those of Haleakala, on the island of Maui, contiguous to Hawaii? Of course, Haleakala is not an active volcano, but its greatest crater of Maui is the largest in the world. Its dimensions are:

Area, 19 square miles, or 12,160 acres.

Circumference, 105,600 feet, or 60 miles.

Extreme length, 39,500 feet, or 7.48 miles.

Extreme width, 12,500 feet, or 2.37 miles.

Elevation of summit, 10,032 feet.

Elevation of cones in crater, 8,032 and 7,752 feet.

Elevation of cave in floor of crater, 7,380 feet.

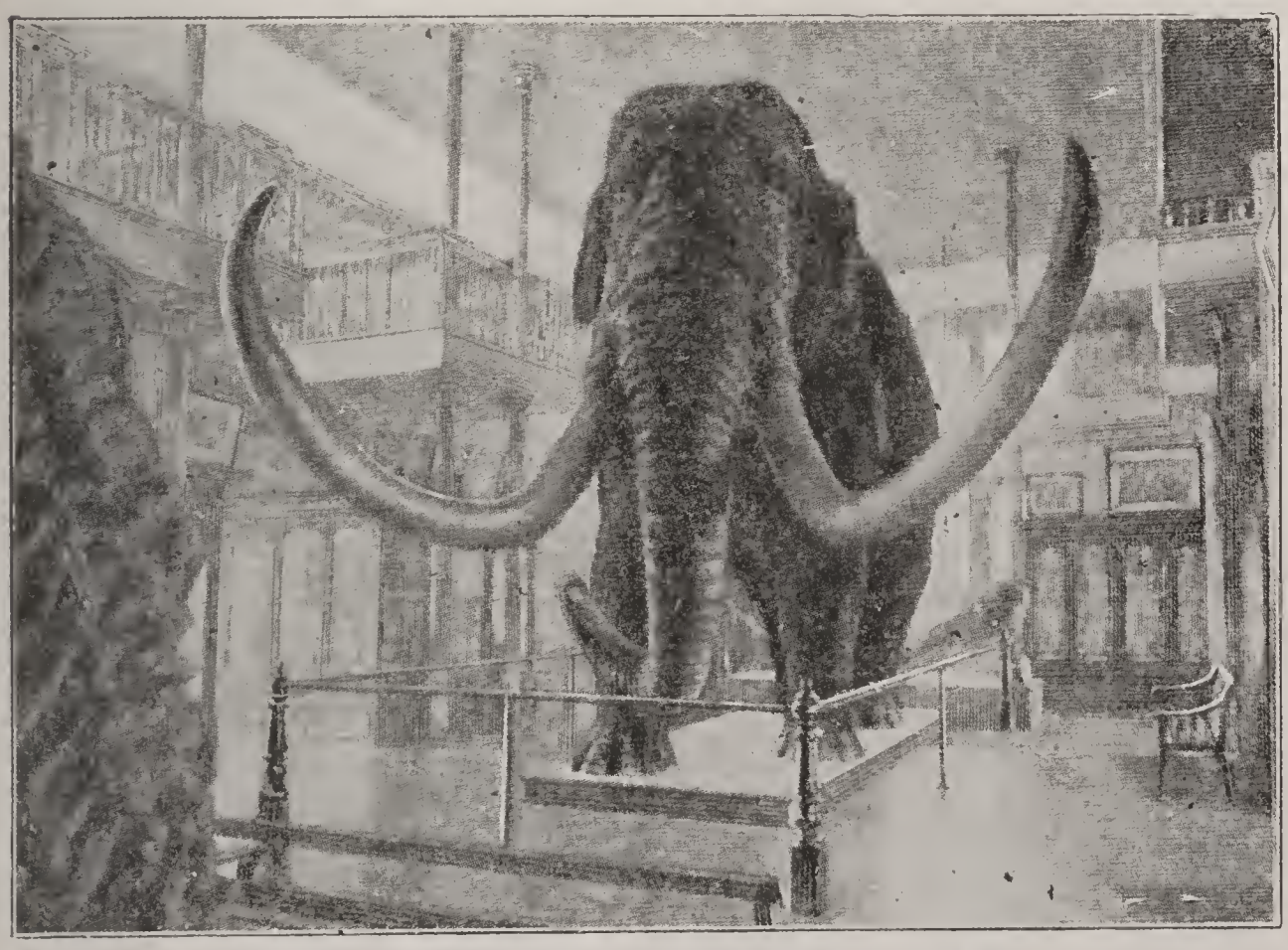
So, if Mauna Loa is to-day the volcano queen of the Hawaiian group, a time was when Haleakala must have been supreme and afforded eruption spectacles such as earth may never see again.

THE MAMMOTH.

An Animal of Prehistoric Days—Tartars Find Its Bones—It Was a Huge, Hairy Elephant—Birthplace Unknown—May Have Come from Asia.

MUCH has been said about the mammoth, its origin, and its haunts when it stalked about the earth. To-day it is unanimously agreed that the animal is extinct, but we have remaining bones, tusks and other portions of the monster's body which give us a great insight into what the beast really was in its day. The first record we have of the animal under a name in any way resembling mammoth is that in which a Russian describes some bones belonging to what the Tartars called a "mamantu"; later on we hear of it as "mammut," then "mammouth," and finally it came down to us as the familiar mammoth. The word to-day is generally applied to gigantic objects, but the name was not given to the animal owing to its extraordinary bulk. Exactly the reverse, however, is true, for the word came to have its present meaning because the original possessor of the name was a huge animal.

Nearly every one knows that the mammoth was a sort of big, hairy elephant, now extinct, and that it lived in the north. The existing elephant of Asia is a very near relative to the mammoth, and in fact may be called a first cousin. The general impression is that the animal was about twenty feet in height and that ordinary elephants would look insignificant in comparison Such is not the case, and the result of much research is that the mammoth averaged about nine or ten feet Of course, there were some giants in the family, and it is perhaps



THE MAMMOTH OF ANCIENT DAYS

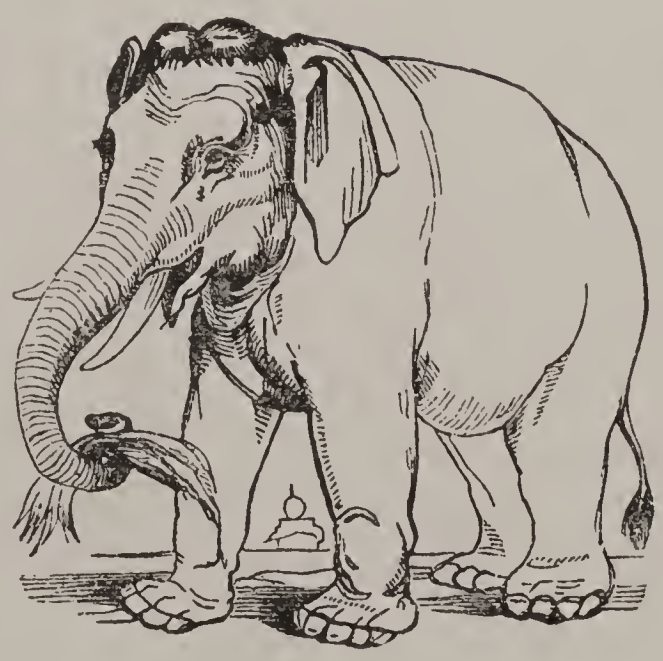
from this that the erroneous idea prevails. Tusks offer convenient terms of comparison: those of an average mammoth are from eight to ten feet in length; those of the famous St. Petersburg specimen and those of the huge specimen in Chicago, measuring respectively nine feet three inches and nine feet eight inches. The largest tusks actually measured were found in Alaska, measuring twelve feet ten inches.

For the external appearance of the animal we are indebted principally to the noted specimen found in 1799 near Lena, embedded in the ice, where it had been reposing, according to geologists, for 10,000 years. Enough of the beast was preserved to show exactly what the covering of the ancient animal was, and that it was fitted out to exist in cold climates and live on the birch and hemlock.

Birthplace Unknown.

Like the birthplace of great characters, the natal place of the mammoth is not known. But the earliest known resting-place of the animal is in the Cromer Forests beds of England, which country was inhabited by him when the German Ocean was dry land and Great Britain was part of a peninsula His remains are found there to-day, while thousands of mammoth teeth, together with soles and turbot are found by fishermen in the North Sea. If it may be taken as truth as a result of researches that the animal originated in western Europe and not in that great graveyard of fossil elephants, northern India, the theory is that the mammoth went eastward spreading himself all over Europe, north of the Pyrenees and Alps. He did not go to Scandinavia, however, as the glaciers of that country offered no temptations. All along his route he has left us his bones to marvel at for years to come.

How the great animal became extinct when it appears he was so well equipped to protect himself against fellow animals, has never been ascertained. It may be safely said, however, that long ages ago he disappeared off the earth. From flints and inscriptions found on tablets it is conclusively proved that man existed contemporary with the mammoth, but beyond that nothing direct can be obtained.



CONSTITUTIONAL LAW.

When and How Often Congress Shall Meet—Powers of the States—Divisions of Government—President's Duties.

THE Congress of the United States must meet at least once every year, and that meeting shall be on the first Monday in December. The Constitution guarantees every man the right of religion and freedom of speech and the press; it also allows the people peaceably to assemble and to petition the government for redress of wrongs. It guarantees to every citizen a speedy trial by jury, and forbids excessive bail or cruel punishment. No person can be held to answer for a capital or otherwise infamous crime unless upon indictment by a grand jury, and no person can be twice put in jeopardy of life or limb for the same offense.

In all criminal prosecutions the Constitution guarantees the accused the right to be confronted with the witnesses against him, and also the right to have compulsory process for obtaining witnesses in his favor, and to have counsel for his defense. While the XIIIth amendment to the Constitution declares that no slavery or involuntary servitude shall exist except for the punishment of crime, and while the XIVth makes all persons born or naturalized in the United States citizens thereof, and the XVth prohibits any State from abridging the right of vote because of race, color, or previous condition of servitude, yet it does not and cannot secure to the negro the right to vote, or any other person for that matter, for this right lies with the States alone, and is controlled entirely by them.

One State cannot undo the acts of another, yet each State must respect the laws and legal decisions of another. Congress may admit as many new States to the Union as may be desired. A State cannot exercise a power which is vested in Congress alone, and, in general, Congress does not exercise powers not specially vested in it by the Constitution. Yet such can be done under the provision which says that Congress can make all laws necessary to carry out the meaning of the Constitution.

Congress cannot pass a law to punish a crime already committed. When a State law conflicts with a law made by Congress under the direction of the Constitution, the State law is void; as, for instance, when Congress passes a bankruptcy law it annuls all State laws on that subject. The government of the United States is divided into three departments, the legislative, the executive, and the judicial. The former is composed of the two houses of Congress, the House of Representatives and the Senate. In these two bodies is vested the law-making power of the government. The head of the executive department is the President, who is commander-in-chief of the army and

navy, and whose duty it is to see that the laws of Congress are faithfully carried out. The judicial department is made up of the different federal district and circuit courts, and is headed by the Supreme Court, which is the last court of tribunal.

The President has the right to veto all bills presented in Congress, and Congress may not pass such bills over his veto unless by a two-thirds vote. The President has the right of pardon, except in cases of impeachment.

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United States senators are chosen by joint ballots of the legislatures of the States. The representatives are chosen from districts in their respective States by popular vote. Bills for revenue can originate only in the House of Representatives. Treaties made with foreign powers by the President or his secretary must be approved by the Senate. In the Senate every State has two senators, and the smallest State has the same rights as the largest. Congress cannot lay any disabilities on the children of a person convicted of crime or misdemeanor for that cause. Territories each send one delegate to Congress, who has the right of debate, but not the right to vote.

SENATOR A. J. BEVERIDGE.

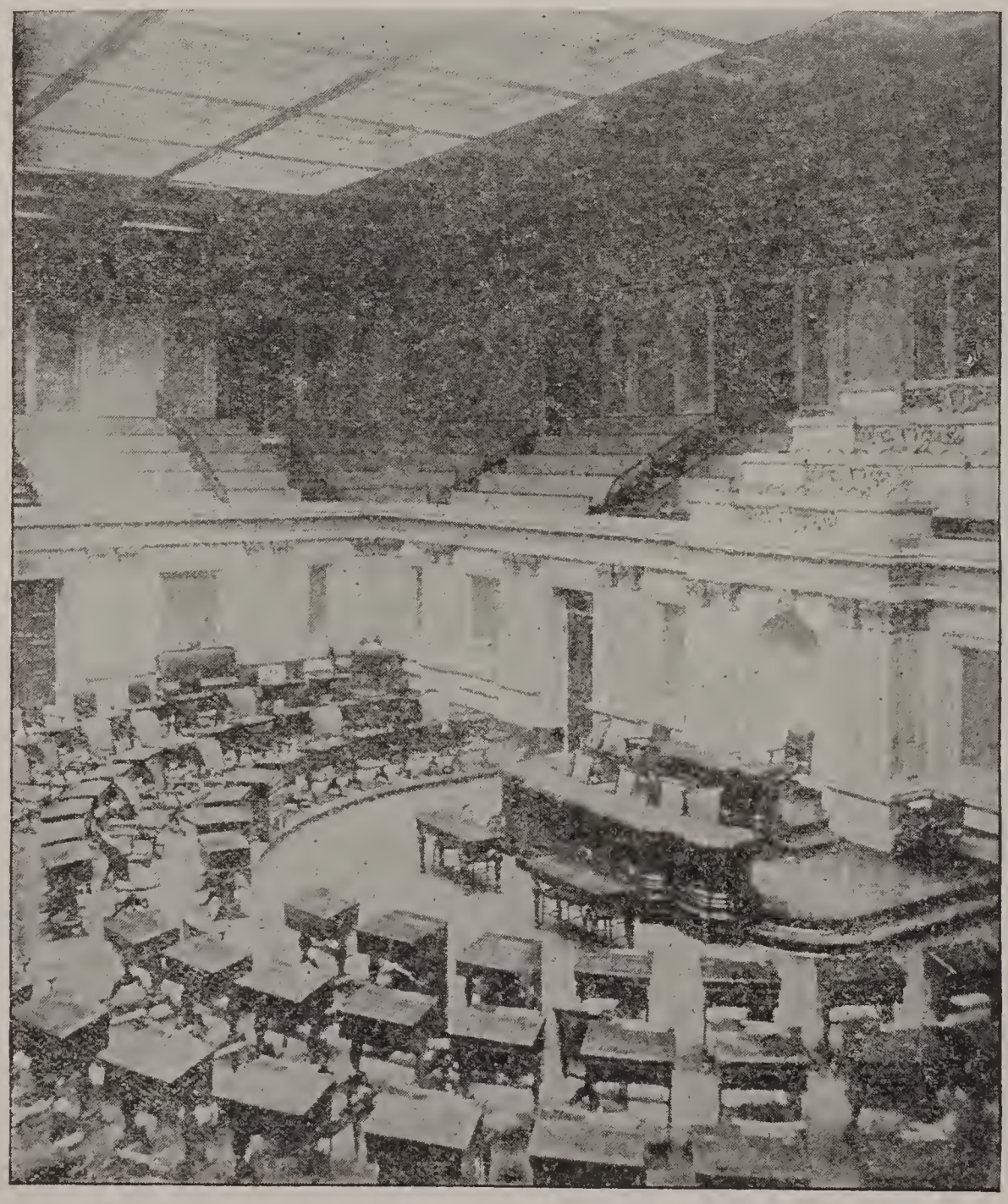
What Treason Is.

Treason against the United States consists only in levying war against them or in adhering to their enemies giving them aid and comfort, and must be proved by two witnesses to some open act, or else by confession in open court. The Vice-President, who is ex-officio president of the Senate, has no vote in that body except on a tie ballot. An officer of the government cannot accept honors from a foreign power without the permission of Congress. The House of Representatives has the sole power of impeachment, and the Senate has the sole power to try such impeachments. No person can be convicted without a two-thirds vote of the members present. A person committing a crime in one State cannot find refuge in another The grand jury is a secret tribunal, and may hear only one side of a case. It simply decides whether there is good reason for holding a trial. It consists of twenty-three men, any twelve of whom may indict. To convict, the unani-

mous vote of a petty or trial jury is required.

If the President holds a bill longer than ten days for consideration it becomes a law without his signature. Silver coin in denominations less than one dollar is not legal tender for more than five dollars. Copper and nickel are not legal tender. Money lost in the mails cannot be recovered. To register a letter does not insure it. Congressmen serve two years each term, and may be re-elected. They must be twenty-five years old.

Senators serve six years, and may be returned by the legislatures as often as is seen fit. They must be thirty years old. The President serves four years, and may be re-elected, though no President has served more than two terms. He must be thirty-five years of age. The same qualifications hold good for Vice-President. A naturalized citizen cannot become President or Vice-President, but a male child born of American parents abroad is considered a native born American, and has the full rights of citizenship, including that to become President. Amendments to the Constitution require a two-thirds vote of each house of Congress, and must be ratified by at least three-fourths the States, either by their legislatures or special conventions called for the purpose. When the federal government calls out the State militia they pass out of the control of the State and under the command of the President.



UNITED STATES SENATE, WASHINGTON, D. C.

TAXATION.

Purposes of Taxation—Manner of Assessment and Collection—Property Exempt from Taxation—Single Tax and its Benefits.

IN order to carry out this great government properly, money to the extent of hundreds of millions of dollars is annually required. The average cost of maintenance of public institutions is about ten dollars a person. To secure this sum taxes are levied upon the populations in many different ways, but all to one purpose. In the smaller towns and country districts, where improvements consist mainly in corduroy roads and the little red school house, the tax is much lower than in the great city where large and beautiful parks, boulevards and public squares, charitable hospitals, free colleges, libraries, and other institutions of the sort, are run at the expense of the State or city. In the large cities the tax each year often exceeds $40 for an ordinary twenty-five foot building lot and frame house.

The manner of assessing these taxes and collecting them is very intricate to the person not informed. In every town there is a collector and a treasurer. These are also assessors who determine as nearly as possible the just value of all the property, and upon what people should pay taxes. Each locality has certain special taxes, possibly to support a school, poorhouse and the like. Then the county has additional taxes for certain public institutions, roads, bridges, etc. Added to these are the general expenses of the State officers and institutions, and lastly, though possibly most important, the general or federal government expenses. Generally the assessors ascertain what property should be taxed, then a State board determines the general needs throughout the State, and equalizes the per cent of tax to be levied, after which the different taxing bodies, such as towns, cities, counties, park commissions, school boards, and the like, lay the tax accordingly. The county clerk makes out bills for the tax and sends them out to the property owners. If the returns are slow the collectors get after the owners and finally turn the money over to the county treasurers, who in turn remit it to the different taxing bodies. Such taxation is what is called a direct tax, and is levied on both real estate and personal property.

Double Taxation.

It often happens that a person or company is doubly taxed, and lawfully. A great amount of the wealth of the country is represented by stocks, bonds, mortgages and similar paper. These represent money invested in some concern which generally has in turn invested it in tangible property. For instance, railroad bonds represent money invested in a railroad company, and indicate part owner-

ship in all the property of the road. This tangible property of the road can be and is easily taxed. It happens that many rich people have investments of wealth in no other form than such stocks and bonds, and it would be unfair not to make them pay their share of the taxation of the country. Accordingly, a tax is laid on this form of wealth. Since the tangible property has already been taxed and the stockholder has to stand his share of the expenses out of the decreased dividends, he thus pays a double tax.

The purpose of the law is that each inhabitant who receives the benefits of the country's government should stand his share of their expenses. But when every one agrees that for the benefit of all certain things should not be taxed it is no more than fair that such should be done. Thus, for the public good all school land, fire departments, government property in general, hospitals, colleges, churches, etc., not operated for a public gain, are exempt from taxation. When, however, some institution, such as a large college, invests in property and rents it for gain, it is generally considered that a tax should be paid. Such is the case in general, though in some States charters are given such institutions that exempt them perpetually on the ground that the money thus saved would be put to educational purposes.

Besides such methods of taxation, and which are generally employed to cover the expenses of the State, county and town, there must be some method for raising funds for the general government of the United States. This is done in several ways, of which the indirect method of tariff or customs duties is the principal. This consists in laying on importations of commodities from foreign countries a certain per cent tax, either on the bulk or according to value of the article, before it can be sold in this country. The principal reason for this tax by the federal government is that it is the most easily raised; that is, very little can escape taxation, and it causes little complaint because it is laid in such an indirect manner that very few realize they are paying it.

Protective Tariff.

At every sea-port a custom-house is located where the proper officials examine all incoming goods and levy the customs duty upon it, which must be paid before the goods can be removed. It would seem at first that this is a great hardship on the importer, but it is only temporary, for he in turn adds the tax to the selling price, and in the end the consumer really pays it. From this tariff on imports has sprung the political doctrine of tariff for protection of American industries. Any infant industry in this country that is trying to compete with older establishments in Europe many times find it hard to cope with the lower prices of the old-world commodities. If, therefore, the promoters of such industries can get Congress to place a tax so high that it is almost prohibitive against these importations, the American plants may reap a good harvest.

Two things stand against carrying this policy to the extreme; one is that the people at large wish to get goods at as low prices as possible, and were these tariffs left off the foreign goods could be sold at a great saving to the common people. The other reason is that protective tariff to be protective to the infant industry must be so high that it keeps out the foreign product altogether, and thus frustrates the very idea for which it was made, that of securing revenue for the government, for if the tax is so high that it keeps the goods out no tax can be

levied. There is, however, another side to the question, and which has the support of many,—that is, that the people at large would rather see American industries active and helping the laboring man to earn a livelihood than to be able to secure certain commodities at lower prices.

Besides the customs tax the federal government levies an internal revenue, such as on tobacco, liquors and at times certain general business transactions. The revenue levied on tobacco and liquors is made against the manufacturer, and is generally in the form of a stamp tax which he pays first and then, by adding the expense to the price of his goods, collects later from the consumer. In time of war taxes are levied on almost every conceivable article of consumption and business transactions. At the breaking out of the Spanish American war Congress passed a war tax, which in general called for stamp taxes on nearly every general business transaction. Among others were the stamps required on bank checks, promissory notes, board of trade transactions, insurance policies, deeds of transfer, telegrams, express receipts, and on nearly every bottle or package of proprietary medicine.

Single Tax.

Other forms of raising taxes in certain localities are by licenses to conduct certain business, as saloons, peddlers' wagons, pawnbrokers' shops, etc., and the federal government raises additional revenue by patent fees, postal receipts, sales of public lands, etc. In many cities certain industries are carried on by the government, and the expense is met by the people. Such, for instance, are gas and water plants, and in some countries the railroad and water carriage monopolies.

A plan to do away with the multiform methods of taxation and substitute for all a single or land tax was formulated by Mr. Henry George, a clever political economist, in his book, "Progress and Poverty," in 1879, and has since so gained in popularity that one country, New Zealand, has it in operation. In the United States, England, Germany and many other countries the idea has been adopted in theory, but the day has not yet come when governments think it possible to make such radical changes as the plan suggests. Single tax men start with the fundamental principle that all men are equally entitled to the benefits of nature, among others air, water and land. They hold that inasmuch as the Creator freely gave these to man without partiality every man should have an equal opportunity to derive the benefits therefrom.

Principal of these gifts of nature is that of land. Without it no one can exist, therefore no man or set of men should hold tracts of land for their own use, and thus exclude others from its benefits, unless they pay for such exclusive use. Land is the only thing which mankind could not do without It is needed by every one in nearly equal degrees; therefore, upon land values Mr. George and his followers would place the only tax. They hold that great land-holders are keeping large tracts of land lying idle when millions of people have not the opportunity to use Nature's gift that would make them free and independent. Consequently some one power should see that the free gift of the Creator should not be monopolized, and to the general government they assign this task.

What Should Be Taxed.

The government is to own all lands, all highways, waters, roads and the necessary accompaniments of land, such as railroads, etc. Not all land would be taxed, but only such as is valuable enough for

some one to wish to use it. It is held that land becomes valuable not from what one person does to improve it, but according to what all society does. Thus a piece of land hundreds of miles from civilization is not generally regarded as of much value. When a town springs up around it and streets are laid out and business is active, that land becomes valuable, not only to the person that was using it, but to every one in the community, for it helps toward making the other land of like value. This value is what is proposed to be taxed.

All other forms of taxation are to be discarded, and no property is to be owned outright by any body but the government. This, it is said by the large land owner, is as bad as the emancipation of the slaves was to the slave holder. Where syndicates have bought up great tracts of idle land and are allowing it to remain idle until civilization and society shall approach and make it of value, and then sell it at a gain, there would be a possible loss. For as long as there is an inch of ground that some one else desires for cultivation, a tax will be put on it accordingly. The landholder could not allow this land to lie idle and still pay a tax, so he would either have to relinquish it or be taxed.

Further than this, since no man could own the land entirely, if any other person came along and saw a piece of ground that just suited his purposes and it was in use he could secure it by paying enough for it. For instance, there is a good farm under cultivation and some farmer thinks it is worth more than the taxes indicate; he will simply ask the government to be allowed to have it, and will state what tax he thinks it is worth,—similar in fact to real estate purchases to-day. The government raises the tax accordingly, and the holder will have to stand the increased tax or sell out his holding rights to the other man. This sale is necessary, for the holder has very likely improved the property by placing buildings, etc., upon it, and the promoters of the plan do not suggest confiscation of the improvements. What single tax really is is little more than a government rent instead of a landlord rent. Such a system would:

1. Simplify the government by dispensing with all taxing bodies, town and other collectors, assessors, etc.

2. Establish absolute free trade with all the world, the same as now exists between the several States of the Union.

3. Take the burden of taxation from the heavily-taxed farming districts, where land is not of great value apart for the improvements,—and part of the plan is not to tax the improvements.

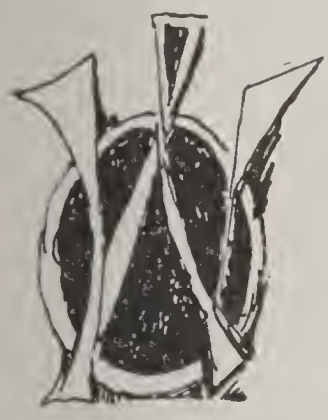
4. Put the tax on highly valuable city lots.

5. Make men pay for public institutions in the proportion that they monopolize the benefits of nature, and make them pay as much for holding land idle as for using it.

6. Make it unprofitable for speculators to hold land unused, enable laborers to have the use of unlimited fields for cultivation of farms, mines, etc., solve the labor problem, raise wages, let every one be employed, and abolish involuntary poverty.

INTERNATIONAL LAW.

Origin of International Law—Influence of Christianity—International Conventions and What they Accomplish—Mediation and Arbitration.

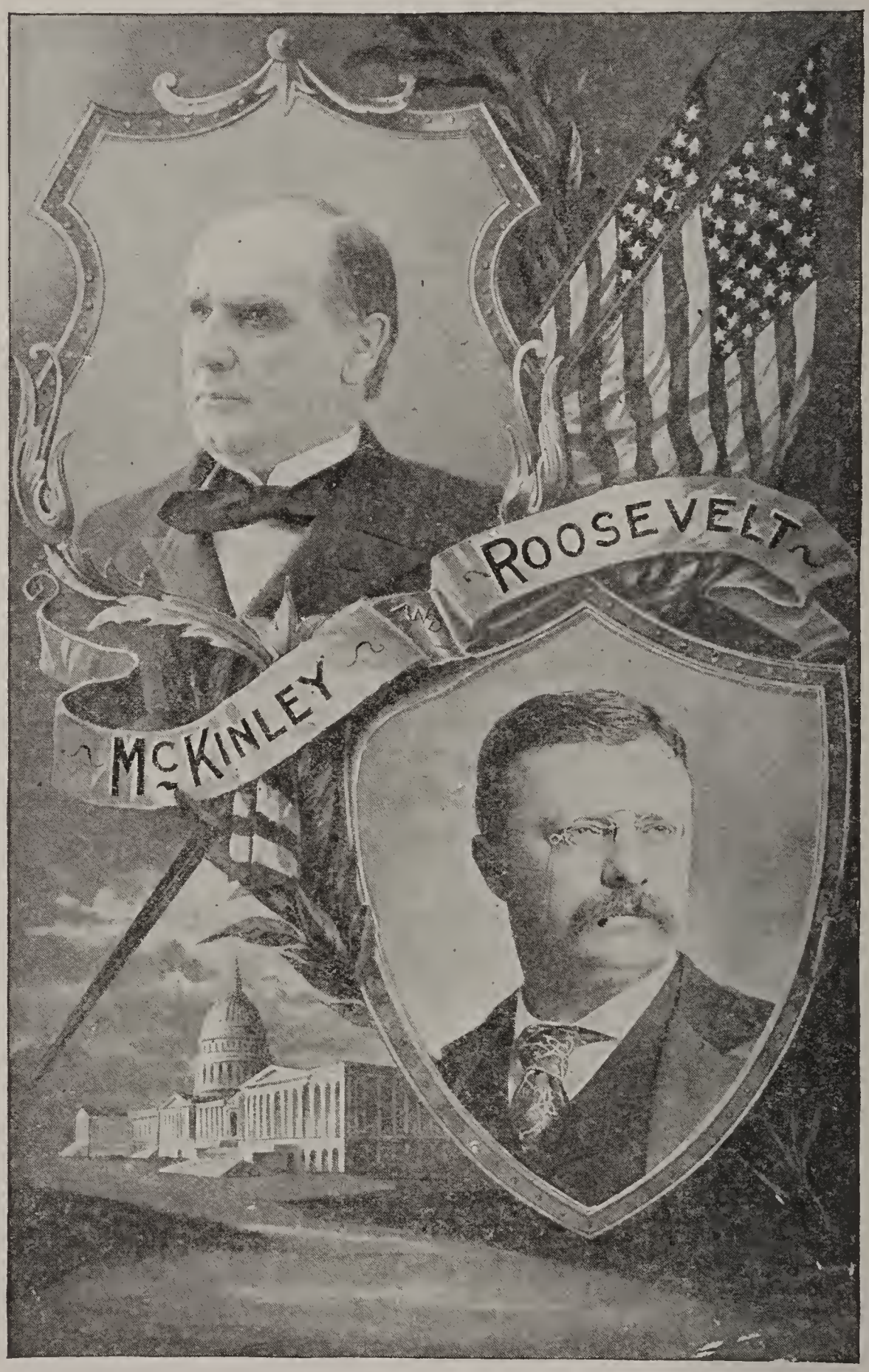


WHEN nations first began to evolve from wandering bands of nomadic savages the main idea with each king was to subdue his neighbor. Thus warfare and barbarism were rampant for centuries. With the growth of civilization, however, nations, as well as individuals, began to see that it would be better to get along in peace and harmony with each other. Consequently alliances and treaties were entered into between many states which afterwards led to great republics and empires. The Grecian states came together and united themselves against the Persians, who had before that joined with the Medes. Countries found that they could get along with each other if they agreed to grant each other certain privileges. In this way as well as by conquest the great Roman empire was built up. Then Christianity stepped in as a still greater factor, and people hesitated to subdue or butcher each other because of the simple teachings of the Man of Galilee.

THE WHITE HOUSE, WASHINGTON.

In these first simple agreements between nations we see the beginnings of the great and complex system of the international law of to-day. When one says law he generally means a rule or order set down for following by some power that can enforce its mandates. In

this respect there is hardly what one can call international "law," for the dearest thing to a government is its sovereignty and no country will allow itself to be governed by any other; thus there is really no power to enforce this so-called law. But nations are to-day so united with each other through their interests of trade and commerce, and through their interchange of citizens, that there must be rules laid down for each to follow. First to understand is that these rules, while they partake of nearly all the phases of supremely ordained law, are yet self-imposed; no nation is bound by any power on earth to agree to something against its will, unless it is so weak that it cannot defend itself against its oppressors.



The Flag of Truce.

This branch of law springs up from many sources, among others are common custom that has been laid down by years of usage, agreements between nations themselves, as by treaties, protocols, etc., and by conventions of a number of nations called together for the purpose of considering some particular rule for the government of all. As an example of the first custom it can easily be seen that when Christianity was adopted by all the European countries anything that was particularly abhorrent to its teachings would be warred against in common. Gradually the armies and navies of the world came to see that certain practices were bad for all countries. Thus the flag of truce, which enables enemies to pass each other immune from danger, was found to be beneficial to all sides.

Certain murderous practices of treatments of prisoners were found to be as bad for one side as the other, and were

abolished. Now one never hears of prisoners being subjected to very harsh treatment. Besides these customs acquired by usage and supported by most nations, there are numerous laws upheld by all that are for the good of all mankind, such as, "Pirates are the common enemies of mankind, and shall be punished by death." Thus a pirate ship flying a flag of a country would be captured and punished as readily by that country as another. And any small country, such as the former Barbary States, that formerly upheld these craft in the war upon commerce, would be punished by one or all of the civilized countries.

Treaties that form a part of international law do so only to that degree that they are accepted by both or all the countries that are signers of the agreement. Thus two countries may agree if they so wish that certain malefactors, as murderers or forgers, shall be delivered to the other country for trial simply upon request. This is binding between the two countries, but upon no others. This may be the case in other things, as tariffs, diplomatic services, general commerce, protection, etc. Now, in respect to these treaties, the signatory powers are bound by honor to uphold them till their expiration or revocation by both countries, upon penalty of war if the countries offended see fit to begin it. The treaty is always a part of the highest law of a land, and if that country does not protect the other country by upholding that law, it shows a breach of friendly feelings, and may justify war to protect the injured country's rights.

International Conventions.

Besides the treaties, we have spoken of conventions of a number of countries. These are called together upon certain occasions, and each state is generally represented by men empowered to draft laws suitable to that particular state. Topics are discussed at these meetings, and generally a treaty of all powers present is drawn up prohibiting certain things in war or peace, which, when the treaty is properly ratified by the governments of the countries, becomes absolute law, and all the countries party thereto are bound in honor by it, and may only break it under the liability of severe punishment by the other states. Some of the laws framed at such conventions are that the flag of truce and the hospital flag shall not be fired upon in war; that neutral countries shall not be molested in their shipping by countries at war; that privateering be abolished; that blockades to be binding must be effective, and maintained by a force sufficient to prevent access to the enemy's coast, and that certain murderous bullets shall not be permitted in war. The honor of all the nations concerned upholds these laws very strictly, and when it comes to their violation by a private individual the state generally punishes the offender as severely as though he had violated a municipal law, for, remember, the international law where accepted by the country is as much a part of its other laws as though enacted by its legislative body solely.

In order to carry out the dictates of international law there must, of course, be tribunals for rulings and agents to look after a country's interests abroad. For this purpose courts are provided by the different countries, such as the United States District and Supreme courts, and the High Court of Admiralty of England. These tribunals decide conflicts between municipal and international laws, and carry out their decisions. Each country is represented abroad by ambassadors, ministers, attachés and consuls. An ambassador or minister is an official ap-

pointed by the chief executive, generally with the approval of a legislative body, and looks after the interests of his sovereign, of whom he is directly the representative. For that reason he is held inviolate in the case of war, and is allowed by courtesy to leave the country to which he is accredited and return to his own.

These officials are intrusted with such great topics for discussion with the visited country as the making of treaties, etc. The consul is the commercial agent of his country. It is his duty to report to his sovereign the state of commerce in the country he is visiting. He also looks after the passports of his fellow countrymen traveling abroad, and protects them from the encroachments of harsh laws to which they might by chance be subjected. Ministers and ambassadors also assume many of the duties of consuls, though the main distinction is that the former are the direct representatives of a country to the court of the accredited country, and only one minister or ambassador is sent to one country; while consuls are merely commercial agents, and are sent to nearly every town in which the country has subjects or does any business. Attachés and secretaries of legations are minor officials at the residence of the ministers, and serve in their absence.

The Nations and Arbitration.

Outside of the great duties of the diplomatic corps of carrying on negotiations regarding trade and peaceful negotiations, perhaps the most noteworthy occupation is that relative to war and its following treaties of peace. Countries are very jealous of their sovereign rights, which allow no one to dictate to them what they shall do. If, therefore, they become embroiled in difficulty with another country the last thing they desire is for a third nation to step in and try to settle the fight for them. Civilization, however, dictates that countries shall be charitable and offer their good services to ameliorate the troubles. This takes several forms, such as arbitration, mediation and intervention. The most common method of settling disputes aside from actual conflict is that of arbitration. The countries disputing generally suggest themselves that a third nation or nations appoint commissioners who, together with representatives appointed by the disputants, shall argue the matter and finally accept the majority vote of all for a final decision.

Some of the greatest disputes have been settled in this manner. It also frequently happens that a strong and powerful country sees the folly of allowing a struggle to go on between nations where it might be amicably settled, and offers her good services toward a peaceful solution of the difficulty. This is called mediation, and is generally appreciated as an act of kindness, even if the disputants do not accept the offer. The third form, or intervention, generally comes in the shape of armed forces and the order that a country shall cease its molestations upon pain of war with the interfering nation. Such was the case in the late struggle between Spain and Cuba, and which by the intervention of the United States brought on our war with Spain. This latter method of settling disputes is viewed askance by most nations, and is a dangerous policy.

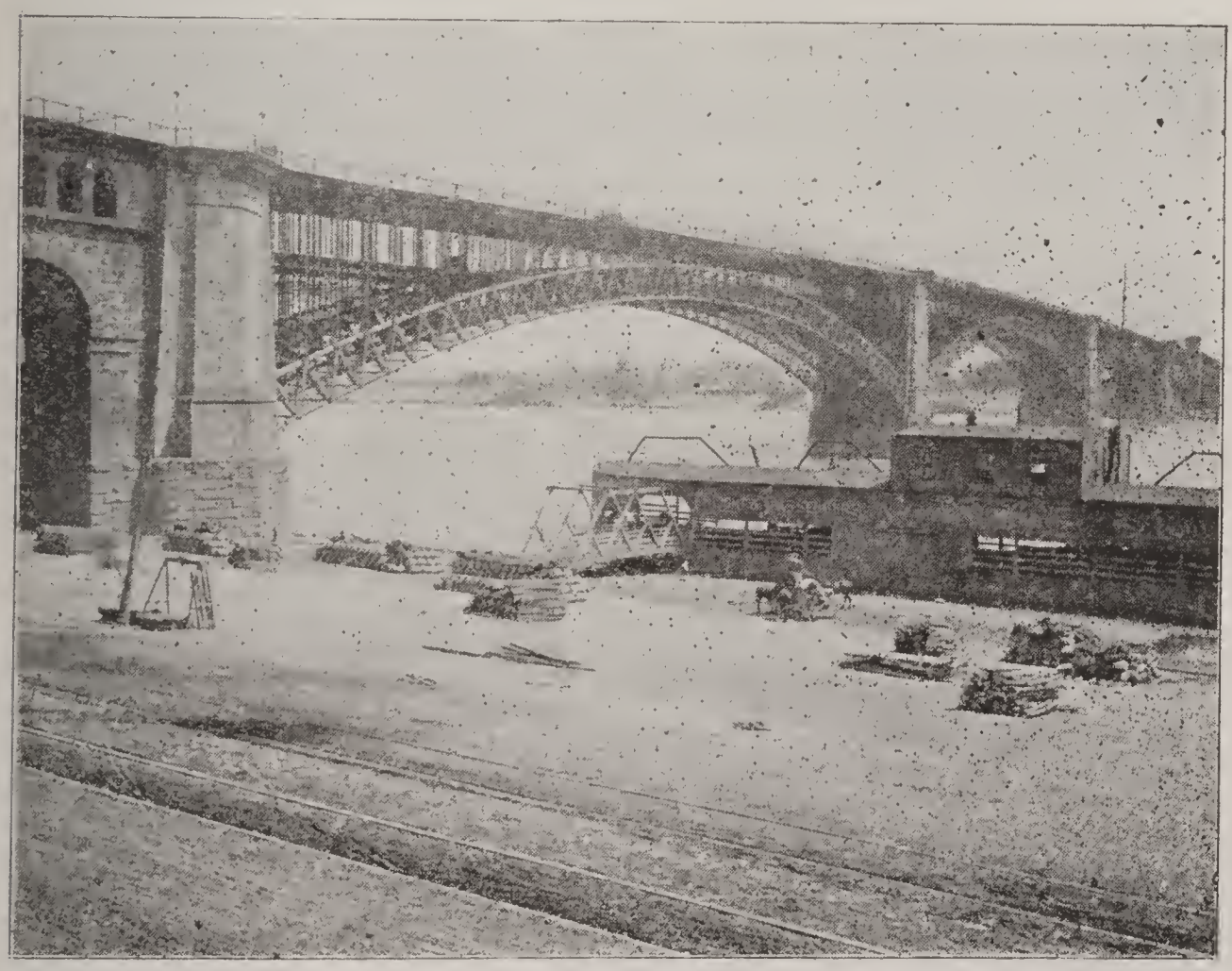
Since the great peace convention at The Hague in 1899, a number of international laws have been adopted by the family of nations. The Czar of Russia called the conference with the purpose of solving the question of universal peace. The meeting resolved itself, however, into an international convention of international law, and the body of resolutions adopted by it and afterwards ratified by

the legislative bodies of the different countries constitute the new laws. One of them calls for a permanent board of arbitration for the settlement of all disputes between the signers. Any nation may in the future feel perfectly warranted to step in and ask that this board settle a dispute that some other nations are having. This solution is the one nearest perfection that has ever been reached.

INTER-STATE COMMERCE LAW.

Board of Inquiry—What It Does—How Rebates Are Given—Other Methods of Eluding the Law.

BY the power vested in Congress by the clause in the eighth section of Article I of the Constitution, which empowers it to regulate commerce among the several States, that body saw fit, in 1887, to pass the present act which controls and regulates that commerce. The law applies to all carriers of public nature engaged in the trasportation of passengers or property by rail or water, or by both, from one State, Territory or district of the United States into any other State, Territory or district. By State sovereignty over its own territory and jurisdiction any one of the States, of course, can regulate its internal commerce without the interference of the federal government, but so soon as the commerce takes on an inter-state aspect by transit into other States or Territories, the federal government is empowered by the Constitution to regulate it.



THE GREAT ST. LOUIS BRIDGE OVER THE MISSISSIPPI RIVER.

Connecting the city and East St. Louis. All railroad trains entering the city must cross this bridge and every passenger pay a toll of twenty-five cents. The bridge is owned by a private corporation.

The law provides for a board of five commissioners, empowered to inquire into the management of transportation companies and the reasonableness of their charges. Among other

things, the act requires that all rates shall be just and reasonable, and that charges for a short haul shall not be more in proportion than for a longer haul on the same line and in the same direction when the circumstances and conditions are similar. This clause in the law was particularly intended to work against the discrimination by the railroad companies in favor of large shippers, who were getting lower rates in proportion than the smaller shippers, and thus could control the market in a number of commodities.

As it is now, any rebates for such cause are illegal, though in fact nearly all the great meat, grain, harvesting machinery, oil, coal and other dealers in similar goods have secret arrangements whereby the law is subverted and the rebates received from the transportation companies. This evil was fought for years before the inter-state commerce law was enacted, but with little effect. By clever pooling of the different railroads, a big grain shipper can send his freight from the Dakota grain fields clear to New York more cheaply than can the smaller fry from Ohio. This gives the Dakotan a chance to shade the market by a good fraction of a cent, and thus to get rid of his supply, when the other farmer must either charge more and stand the chance of slower sales, or else meet the figure of the Dakotan and not make so large a profit.

Another manner for eluding the law and for gaining more business for both the road and the dealer is in the harvesting machinery business. In order to retain the large freight shipments of harvesting machinery houses, railroads sometimes grant, contrary to law, a rebate of 25 per cent to the shippers. This big saving in expense to the manufacturers of course influences them to turn all their business over to that road, and while a gain for the road, is a greater gain to them, as it enables them to place their machines in the field at such greatly reduced rates that they can easily outbid their competitors.

All these violations of the law were foreseen and stipulated against in the law, such as by the enactment that there shall be no discrimination between persons or classes of traffic or localities. The law

MISSISSIPPI RIVER STEAMBOAT.

At her landing, preparing to take on freight. These steamers are smaller than either lake or ocean vessels.

also calls for public printing of the rates charged, and that the books of the companies shall be open annually for inspection by the commission. Exceptions are made in the act for the carriage of the property of the United States or municipal governments, charitable institutions or to and from fairs and expositions, and it allows the issuing of mileage, excursion and commutation tickets, and permits the issuing of reduced rates of transportation to ministers of religion, and free tickets to officers of the carrier or other carriers.

TEST CAR OF THE UNIVERSITY OF ILLINOIS.

What the Car Is to Accomplish—How It Is Equipped—Its Dimensions—Apparatus Used.

THE University of Illinois and the Illinois Central Railroad have joined hands in an unique undertaking that promises to revolutionize some parts of university work and to bring practical knowledge of railroad work home to students with new force. The university and the railroad have completed a test car. The car is designed, in the language of Prof. Edward C. Schmidt, of the university, for general railroad experimental work, and is adapted for the following purposes:

Measurement of train resistance.
Autographic track inspection.
Locomotive road tests.
Air-brake tests.
Station tests.

The car is owned and operated jointly by the Illinois Central and the railroad mechanical engineering department of the university. The car was built by the road, and the apparatus and other equipment by the university. Hydraulic transmission of the pressure and motion has been adopted for both the apparatus for dynamometric work and for track inspection. The three men responsible for the car and its equipment are William Renshaw, superintendent of machinery of the Illinois Central; Prof. L. P. Breckenridge, and Prof. Edward C. Schmidt of the University.

In building the car care was taken to give it extraordinary weight, in order that it might withstand the usage it will receive in the heaviest freight service. It is 45 feet 4 inches long and 40 feet over the end sills. The inside width is 8 feet 4⅜ inches, the outside width 9 feet 1⅝ inches, and an extreme width over the observation windows of 10½ feet.

Division of Space.

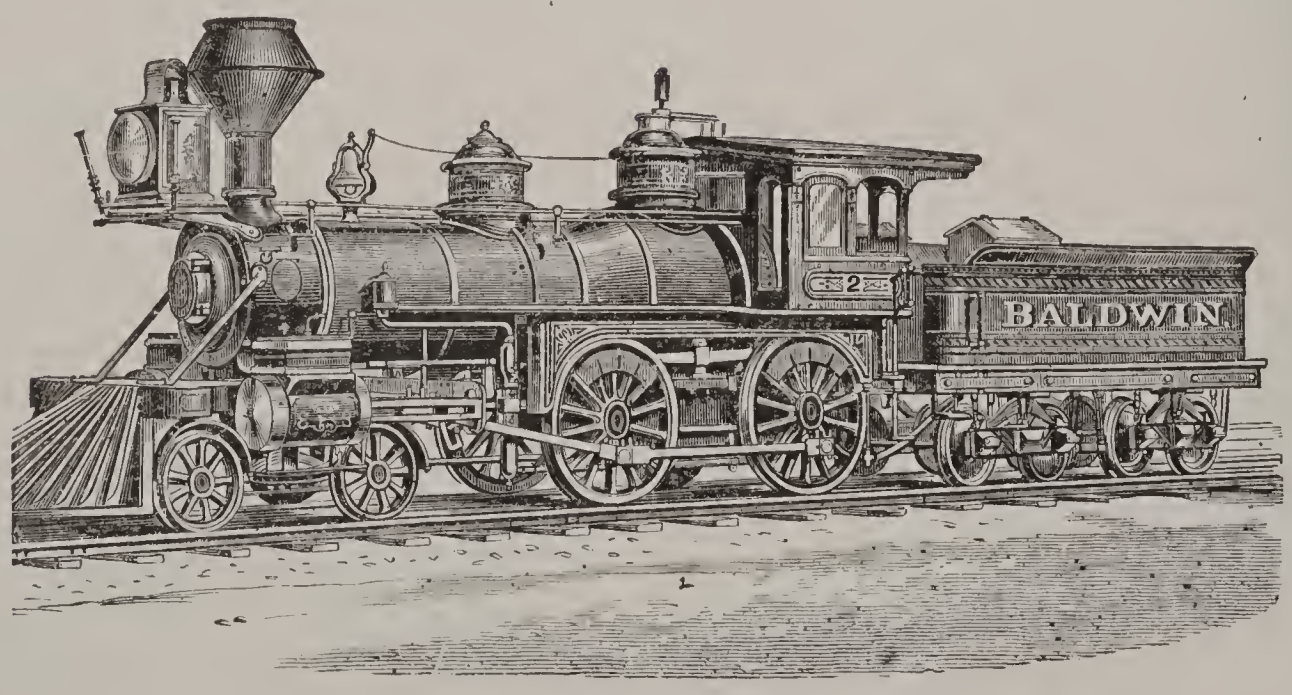
The space given up to berths, lockers and toilet rooms for the use of the students and professors is about fifteen feet. The working space for the tables and instruments is a little over forty feet. On the rear of the car a lookout is provided, from which the handling of the train may be observed. In this lookout are signal push buttons and pens for the dynamometer record of location of mile posts, stations, curves and grades. At the front end are projecting windows, from

which the train and engine may be watched.

The apparatus for the measurement of train resistance is practically completed. So fine is this apparatus that the pressure due to the pull on the drawbar is taken in a cylinder filled with oil, and this oil transmits this pressure to the recording and indicating gauges. It is provided that the record of the amount of drawbar pull shall be made on a continuous strip of paper. This paper is driven from the car axle. Upon it are marked, in addition to the curve showing the pull on the drawbar, the location of mile posts and stations, and also the time. The mile post pen is controlled by electro-magnets. It is drawn slightly aside at stations and mile posts by the magnet when the observer in the lookout touches a button. The pen which records the time is automatically controlled by a clock, which makes electric contacts every five or ten seconds, as may be desired. A speed recorder is also provided for. The oil pump receives its supply from an oil tank, and by arranged piping forces it into the three cylinders of the dynamometer. Oil is cleared from the cylinders by the use of compressed air.

It has been arranged that the working pressure of the oil in the cylinders shall be from 300 to 1,000 pounds per square inch, and for this range of pressures the first, or largest, cylinder has sufficient capacity for the heaviest freight service. The intermediate cylinder will be used on a train of ordinary tonnage and the smallest cylinder in passenger service. To the table upon which are the dynamometer recording gauge, the rolls for driving the paper chart and the Boyer speed gauge, has been attached a vertical shaft, which derives its motion from the car axle by means of spiral and bevel gears.

In addition to this apparatus the car is equipped for locomotive road tests with gauges for indicating and recording boiler pressure and steam-chest pressure, duplex air gauge, air-brake train line pressure recording gauge, and the other apparatus used in locomotive tests.



THE GRAND CANON.

A Wonderful Freak of Nature—Located in Arizona—A Great Gorge in the Mountains Caused by Water Erosion.

THE Grand Cañon of the Colorado was discovered by the early Spanish explorers in 1540, and lies in the northern part of Arizona. At the first view of the Grand Cañon one is unimpressed by any detail; but is overwhelmed by the ensemble of the stupendous panorama, a thousand miles in extent, that lies wholly beneath the eye, as if one stood upon a mountain top instead of the level brink of a fearful chasm, whose opposite shore is thirteen miles away, and whose depths are more than six thousand feet below. A cañon, but not the accepted type; an intricate system of cañons, rather, each subordinate to the river channel in the midst, which is itself subordinate to the total effect. The spectacle is so symmetrical and so completely excludes the outside world, and its accustomed standards, that only by descending into the cañon is it possible to comprehend anything of its proportions.

FINGAL'S CAVE, SCOTLAND.

Hewn out by the ocean waves and supposed to have been occupied by Fingal, bard and ancient king.

YELLOWSTONE NATIONAL PARK.

Wonders of the Geysers—Lofty Mountain Peaks—Canons of Beauty—Mammoth Hot Springs—A Mountain Lake.

YELLOWSTONE National Park, of Wyoming, the greatest natural wonderland in the world, presents a very wide range of phenomena in its 3,000 square miles of territory. In reality, it is not a park, but rather an aggregation of parks, with lofty mountains, great lakes, crystal cascades and mighty cataracts, deep and wonderfully made cañons, translucent springs, painted cliffs, spouting geysers, mountain valleys, mud volcanoes, sulphur mountains, and thousands of deer, elk, antelope, bears, beavers, wild fowl and feathered game, and the streams full of trout.

OLD FAITHFUL.

One of the great geysers of the Yellowstone Park, spouting scalding water and steam.

The park is well provided with modern hotels, near the more prominent points of interest, among which are the Mammoth Hot Springs, with their peculiar cliffs or terraces, covering a large area on the side of Terrace Mountain, at the base of which stands Liberty Cap, an extinct geyser of strange form, while above it are Cleopatra, Minerva, Pulpit, Mount and Jupiter terraces, and higher still are Devil's Kitchen, Cupid's Cave and Angel Terrace. In Norris Geyser Basin one finds the Black Growler, the only steam geyser in

the park, and one that is always roaring; furiously boiling springs of yellow, green, pearl and white water, a beautiful terrace like white marble; the Devil's Inkstand; Congress Spring and Monarch Geyser.

Then passing Elk Park, through Gibbon Cañon and the valley of the Firehole River to the Geyser basins. In Lower Geyser Basin are Fountain Geyser, Clepsydra Spring and the Wonderful Paint Pots. In the Upper Basin are the Old Faithful, Bee Hive, Castle and other famous geysers. Black Sand Pool, Cliff Spring, Sunset Lake, Emerald Pool and the Three Sisters. Yellowstone Lake is one of the highest known lakes in the world—7,741 feet above the sea level—very irregular in form, and the shores picturesque.

WEIGHT OF CATTLE.

How to Compute Weights of Cattle—Table of Factors—The Fractional Weight of Quarters and Hide.

TO compute the dressed weight of cattle measure as follows in feet:

1. The girth close behind the shoulders, that is, over the crop and under the plate, immediately behind the elbow.

2. The length from a point between the neck and body, or vertically above the junction of the cervical and dorsal processes of the spine, along the back to the bone at the tail, and in a vertical line with the rump.

Then multiply the square of the girth in feet by the length, and multiply the result by factors in the following table, and the quotient will give the dressed weight of quarters:

Condition—	Heifer, Steer or Bullock.	Bull.
Half fat	3.15	3.36
Moderate fat	3.36	3.5
Prime fat	3.5	3.64
Very prime fat	3.64	3.85
Extra fat	3.78	4.06

Illustration: The girth of a prime fat bullock is 7 feet 2 inches, and length measured as above, 4 feet 5 inches.

Seven feet 2 inches equals 7.17, and 7.17 squared equals 51.4, which multiplied by 4 feet 5 inches and by 3.5 equals 794.5 pounds. Exact weight was 799 lbs.

Comparative Weights.

Quarters of a beef exceed by a little half weight of living animal. Hide weighs about eighteenth part, and tallow twelfth part of the animal.

COMPARATIVE WEIGHTS OF LIVE BEEVES AND OF BEEF.

	Lbs.	Per cent.
Bullocks	2,800	72 to 78
Heifers	2,600	70 to 76
Bullocks	2,600	
Heifers	2,400	66 to 70
Bullocks	2,400	
Heifers	2,100	64 to 68
Bullocks	2,100	
Heifers	1,800	63 to 66
Bullocks	1,550	61 to 64
Heifers	1,550	
Bullocks	1,260	58 to 61
Heifers	1,200	
Bullocks	1,050	57 to 58
Heifers	1,050	
Bullocks	980	50 to 56
Heifers	950	

THE FILIPINO IN SPORT.

How the Islanders Hunt—They Are True Sportsmen—Ducks and Snipe Are Plentiful—Cock-Fighting Indulged In.

THE Filipino is a hunter and a sportsman. He does not hunt for the purpose of profit. Although he is something of a vegetarian, he keeps his larder supplied with ducks, snipe, pheasant and deer. The serious sport is in hunting the boar, wildcat and wild water-buffalo. The Filipino's weapons consist of ancient carbines of the flint-lock type, bamboo arrows, spears and boloes.

The native is fond of carabao (wild water-buffalo) hunting. It is too hazardous to attract the Englishman. The carabao is found in the Camatines, in the center and north of Luzon, and in the vicinity of Manila. The deer consist of three varieties, two of them peculiar to the island; small and fleet-footed. The smallest is the cherrotain or mouse deer, not much larger than a house cat. Snipe, quail and wild duck inhabit the marshes and rice fields.

The national sport is cock-fighting. This amounts to almost a passion with the natives. Sunday is the favorite day for a fight, but no holiday is complete without one. Men, women and children attend these fights, and

JAPANESE WRESTLERS.

Engaged in their favorite sport, with a third acting as umpire or referee. The Japanese are experts in wrestling, being wiry and agile.

women gamble as freely as the men on every point of the bird's chances. Even the children cannot resist it. The wife and children are often neglected that these fighting cocks may receive proper attention.

The sport of the higher class of Filipinos is polo. Many of the towns have good courses. The Filipino pony is not a native of the islands, but was originally brought over from China. It is swift, stocky and handsome. It thrives on water sweetened with molasses and rice paddy. It sleeps on a stone floor and is quite frisky. The rich half-caste element indulge in fencing, the knowledge of which was brought from Madrid and Paris by General Luna.

IGORROTE RUNNERS OF THE PHILIPPINES.

Men Who Travel Far—Bearers of Burdens—Well-built Racers—Sleep at Any Time —Carry Food for Others.

THE Igorrotes of the Philippines are a race of long-distance burden-carriers and runners. They are a bundle of muscle, and their physical development is fine. The basket they use for carrying purposes is called chu-gee, and is a framework consisting of a strong back, rectangular in shape, made of split bamboo or hard-wood splints, about sixteen inches across and thirty

FRUIT GATHERERS AND MERCHANTS OF THE ISLAND OF LUZON, THE PHILIPPINES.
Their style of dress and manner of house building also shown.

inches high, which fits on the back, projecting at its upper end above the nape of the neck, while the lower end rests well down on the spine. To this framework is fastened, about a third of its way down, tied on each side, forming a single loop, a heavy carrying-band, made of dried and beaten manila hemp. It is passed over the upper point of the forehead, and ordinarily sustains most of the weight of the load. There are other bands which pass under the arm and over the shoulder, so that when the carrier's neck becomes tired he can throw the weight on the shoulders.

CAMP OF U. S. TROOPS BOUND FOR THE PHILIPPINES.
At the Presidio, San Francisco—Awaiting orders.

Narrow wings, or side flaps and a bottom piece are added to this device. These are drawn up against the load, as retaining boards. The Igorrote's training begins when he is about eight or nine years old, by following long and difficult trails until he becomes hardened. The little mountain horse so common in the Philippines is not used as a beast of burden, as it is said he could not make the difficult inland trips more than once in ten days and keep in condition, while the human beast of burden can make them day after day and keep in condition. All food and merchandise which goes into the interior of these countries is packed on the backs of these carriers and thus transported.

SAME CAMP OF U. S. TROOPS.
Three minutes after the order was given to strike tents and form for marching.

Like the Chinese, the Igorrotes can sleep anywhere, and their power of endurance is almost as great. The women

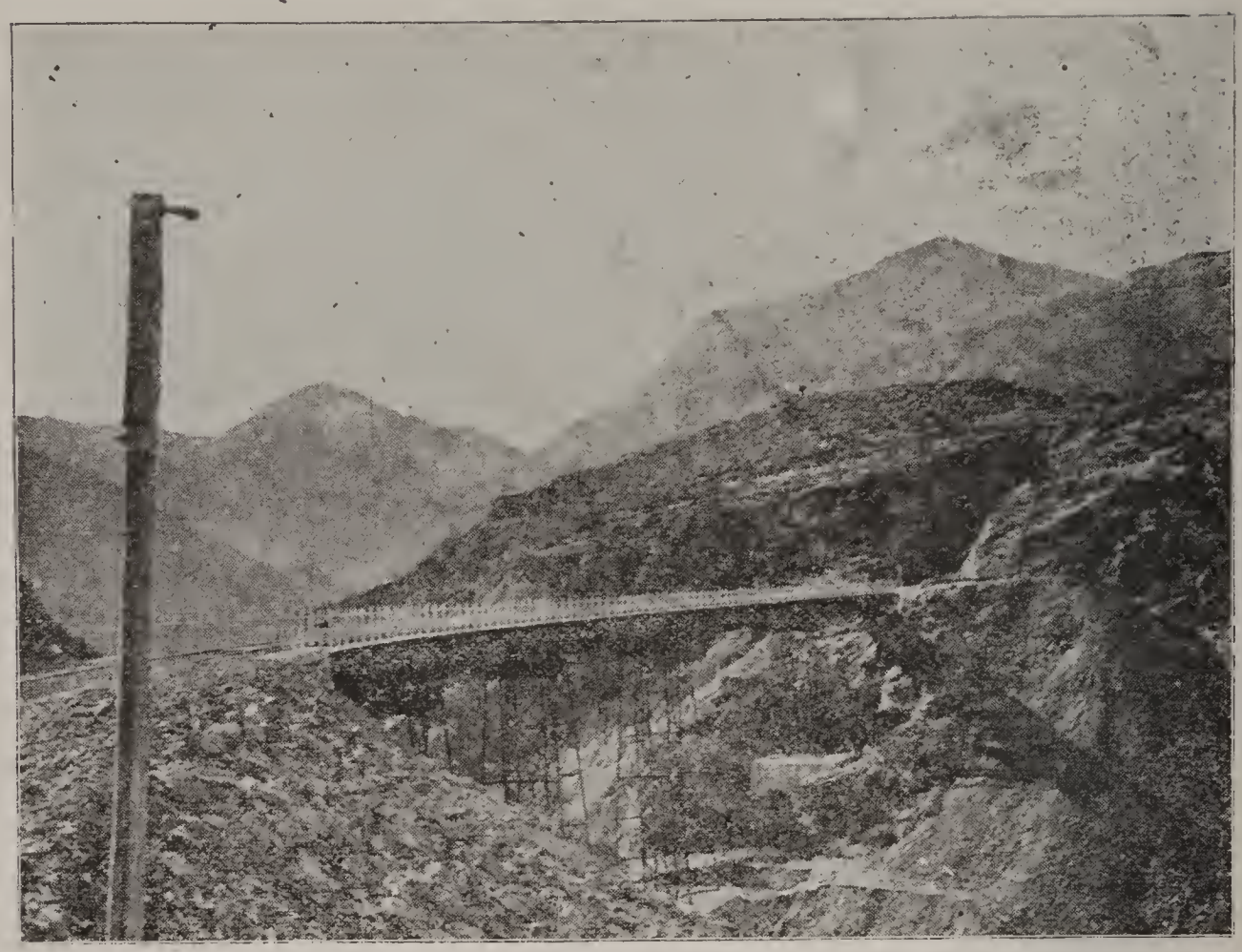
perform an equal share of work with the men. They have a basket of their own, differing from that of the men in that it is round and tapering at the bottom. It is carried in much the same way as the chu-gee. These carriers have been very useful to the American army in the Philippines, keeping the garrisons supplied with food by carrying it from the coast depots. And the trail followed through the mountains, up and down, is not an easy one to travel. The only garment which the Igorrotes wear is a katap or cotton shawl for the protection of their backs and heads at night. When dusk comes on they light small camp fires, boil their rice and potatoes, which they eat with their hands from the common pot. After the meal each man smokes a pipe, and his tobacco is not the best, but he is satisfied.

WHEN MOUNTAINS BLOW THEIR HEADS OFF.

Great Volcanic Eruptions—Krakatoa and Its Ruin—Streams of Lava and Water—Thousands of Lives Lost.

THERE are two kinds of eruptions to be noted in the history of volcanoes, those that build up slowly and those that destroy swiftly. The eruptions that build up mountains are periodical wellings over of molten lava. The others are violent explosions, occurring at irregular intervals and bringing widespread destruction. It often happens in the case of a volcano that builds itself up, when the lava forms a hard shell and the crater crusts over at the top, men say the volcano is dead. But this is not true. The fires are there at the core—latent energy ready to be stirred. The cause of the sudden eruption of these volcanoes is the same principal as a bursting boiler—the sudden and excessive generation of steam caused by the hot part of a volcano coming in contact with water. This contact may be due to the readjustment of strata or materials beneath, so that a stream of water is turned into the crater.

The greatest explosion ever known was that of Krakatoa, August 26 and 27, 1883—a little island in the Strait of Sunda between Java and Sumatra. Krakatoa had but one peak, measuring scarcely 3,000 feet. The island was uninhabited and not touched by ships. The volcano itself was considered insignificant. For nearly two hundred years the volcano had been considered as dead, but on May 20, 1883, she began to roar and rumble. For three months this continued until the 24th of June when a second crater opened. After this a third opened. The low-lying walls of the craters gave way in many places. Then thousands of tons of water surged downward on August 26th. Explosion followed explosion until there came one more violent than all the rest. The noise was heard at St. Lucia Bay, Borneo, 1,116 miles distant; at Perth, West Australia, 1,902 miles away; at Alice Springs, South Australia, 2,233 miles distant; and at Diego Garcia, an island in the Indian Ocean, 2,267 miles distant.



A MOUNTAIN SCENE ON THE SANTIAGO & VALPARAISO RAILWAY IN CHILE, SOUTH AMERICA.
The bridge construction is fine.

Destruction Wrought

The force of the explosion disturbed the water to such an extent that lighthouses in the Strait of Sunda, towns and villages on the shores of Java and Sumatra bordering the strait, boats and vessels on the same shores, were all destroyed and nearly 37,000 thousand lives lost.

The greatest explosion of the eighteenth century was that of Asama in 1783, which has been regarded by many authorities as one of the most frightful in the history of volcanoes.

Asama rises to a height of 8,000 feet, and according to records sent down a river of mud from five to ten miles broad, that overwhelmed forty-two villages. The records continue:

"In some places the mud was so hot that it did not stop boiling for twenty-four days. In the Tonezawa River immense masses of lava remained red hot even in the river itself. In Kurogano a stone 120 by 264 feet, one among many, fell into a river and formed an island. Two rivers were sucked up into the mud torrent and their places taken by dry land, and the noise of the explosion was like a thousand thunders. The lakes were poisoned, the fish sickened, the rivers were full of dead dogs, deer and

BRIDGE ON THE CUSCO RAILROAD, SOUTH AMERICA.
Showing elevations in the Andes and class of bridge work.

monkeys, with hair singed from their bodies."

Then there was old Bandaisan, in Japan. For years this innocent volcano was regarded as dead. No one knew of any eruptions, and the inhabitants nearby felt perfectly safe, but on July 15, 1888, Bandaisan, without warning and apparently without reason, blew her head off and discharged 1,600,000,000 cubic yards of rock and earth.

The Bandaisan and Krakatoa Eruptions are the most famous of modern times. The active volcanoes of the Hawaiian islands have caused considerable uneasiness. The Asiatic and American shores of the Pacific Ocean are dotted with volcanoes from Japan to the islands of the Indian Ocean, and from Patagonia to Alaska, but the most active volcanic center in the world is the Java island and its vicinity. This island, having about the area of England, contains forty-nine great volcanic cones, some of which are 12,010 feet in height. Etna has more than two hundred quite conspicuous cones within a radius of ten miles from the center of the main crater. Little was known of the volcanic forces pent up in Vesuvius prior to 79 A. D., when the great catastrophe took place, destroying Pompeii.

THE CARRIER PIGEON.

Their Value in Peace and War—Dr. Andree Used Them—The Homing Pigeon—High Speed Attained.

DURING the last few years no phenomenon more interesting and unsolvable than the feats of the carrier or homing pigeon has presented itself. This bird has proved to be of inestimable value both in times of peace and of war. Were it not for the services of one of these faithful animals the scientific world would be without the reports of Dr. Andree's arctic explorations. In the late Philippine war the bird demonstrated its value by carrying messages for the army. In times of peace it is utilized for carrying the results of yacht races and other messages where access cannot be had to the telegraph.

A remarkable feature in connection with the homing pigeons, and one that is not generally known, is the wonderful instinct the bird has for finding its home. The general opinion is that the bird may be started with a message from any point to another given point. Such is not the case. The pigeon will return to its home and nowhere else. These birds have been taken in boxes thousands of miles and then permitted to spread their wings to the air. They soar towards the heavens for a few minutes and then dart out in a direct line for their homes.

In making these flights the speed attained by the birds is remarkable. In many instances a rate of speed has been maintained for a thousand miles which cannot be excelled by the Empire State Express itself. The breeding of these birds is now more than a sport; it is a profession. Several experts are giving their time and money to the training of these birds, and their pedigrees, like that of great race horses, may be found to extend for generations.

FOREIGN TRADE GAIN.

United States Leads All Nations—Important Statistics Collected--A Hundred Years' Growth—National Prosperity Shown.

IT is in the exportation of manufactured products that the United States is making the greatest strides, showing that we are no longer simply an agricultural nation. The exportation of manufactures alone in the nine months ending with September, 1900, amounted to $338,687,243, against $227,502,649 in the corresponding months of 1899, and $145,793,834 in the same months of 1895.

THE BOURSE, OR WALL STREET, OF LONDON.

Where the prices of the money market of the world are made and unmade every legal day of the year.

Thus the exportation of manufactures has increased nearly 25 per cent in one year, and has more than doubled in four years from 1896 to 1900, while the importation of manufacturers' materials has also increased at a very rapid rate.

Exports of manufactures of iron and steel alone amounted to $110,000,000 in round numbers, in the ten months ending with October, 1900, against $86,000,000 in the corresponding months of 1899, and $51,000,000 in the corresponding months of 1897, thus having more than doubled in the three years from 1897 to 1900.

Not only have the manufacturer and the millions dependent upon his industry shared in the prosperity, but those engaged in agriculture and mining seem to have been equally prosperous, judging from the record shown by the figures of our export commerce. The exportation of agricultural products in the ten months ending with October, 1900, is in round terms $700,000,000, as against $625,000,000 in the same months of 1899, while the products of the mine, the forest and the fisheries also show an increase in 1900 as compared with the figures of 1899.

This increase in the products of industry is especially interesting in the fact that in many cases it shows a higher reward for a given quantity of labor or in other words higher prices received for the article itself, as well as an increase in the quantity produced and sold.

LONDON BRIDGE AT THE NOON HOUR.

When it carries the greatest throng. The bridge is famous in poetry, prose and song, and crosses the river Thames.

Producers Earn More.

In cotton, for instance, the average export price per pound in the months of September and October, the beginning of the new cotton year, has been 9.9 cents against 6.7 cents in the same months of the preceding year, while in other agricultural productions and in various lines of manufactures especially those of iron and steel, and in the products of the mine there are increased prices per unit of quantity, and thus better earnings for those who produce them.

A comparison of conditions in the United States with those in other countries, as measured by the foreign commerce, indicates a degree of prosperity which compares favorably with any country of the world. Our own exports for the ten months ending with October

show an increase, as has already been noted, of $166,000,000, while in the exports of the United Kingdom the increase in ten months is $125,000,000; while the 1900 figures for Belgium, France, Spain and Italy show no increase in exportations during that part of the year 1900 whose record is now available.

In the case of Belgium, France, Spain, Italy, Germany and the United Kingdom, the imports are greater than the exports, while in our own case the exports vastly exceed the imports, the excess of exports over imports in the ten months ending with October, 1900, being $499,667,936, or a greater excess than in the corresponding period of any preeding year and a greater excess than that of any other country of the world.

A most impressive showing of the growth of American commerce and of the wonderful balances in this country's favor during the last thirty years of the past century is found in an official report. Imports exceeded exports almost continuously prior to the decade 1871-80, and since that time exports have almost continuously exceeded imports, but the excess of exports over imports in the decade 1891-1900, is extremely large, as compared with any preceding decade, amounting to $2,615,343,320; while, as already shown, the excess of exports over imports in the single year 1900 will also be greater than in any preceding year in our history.

THE LLAMAS OF SOUTH AMERICA.

Used instead of horses to carry freight and other burdens over the mountains. They are docile.

ENORMOUS GOLD PRODUCTION.

Wonderful Record of 1900—What Is Expected in Year 1901—The United States Becoming the Greatest Gold-Producing Country in the World—Foreign Nations Seek Our Gold—Important Figures on Production.

THE following compressed story of the world's work in the gold fields is told in millions of dollars:

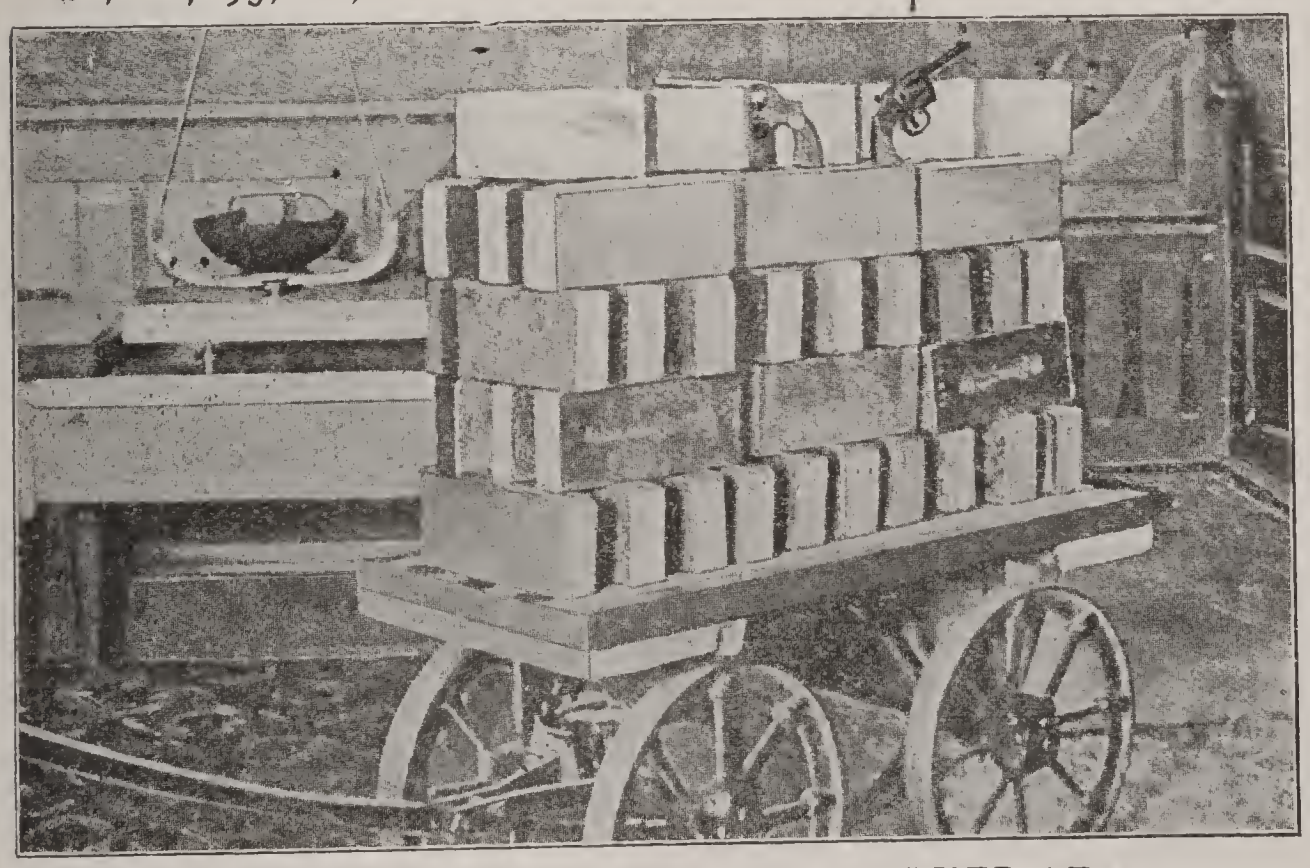
	1899.	1900.	1901
United States	71	82	94
Canada	21	25	30
Mexico	8½	8½	8½
Africa	73	5	75
Australia	80	38	88
Russia	22	23	33
India	8½	8½	9
China	5½	4	4½
All others	17	18	23
	306½	257	365

The world's production of gold for the last decade of the present century, using the above semi-official estimate for 1900, is $2,106,195,000, as follows:

1891	$130,650,000	1896	$202,250,000
1892	146,300,000	1897	238,810,000
1893	157,500,000	1898	287,425,000
1894	181,000,000	1899	306,500,000
1895	198,760,000	1900	257,000,000

Compare this, the production of the world's standard money metal, with that of the preceding decades of this century:

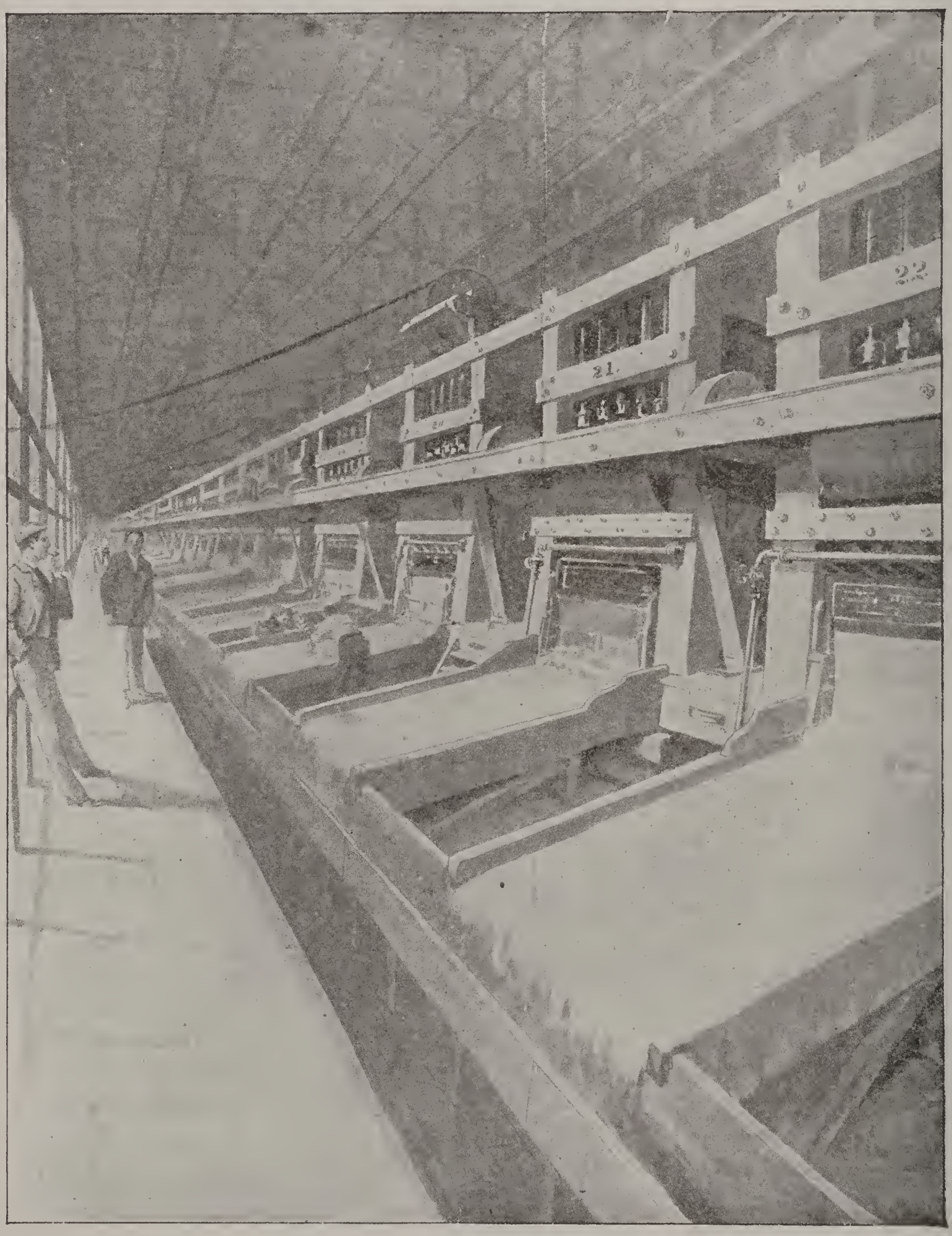
1891-1900	$ 2,106,195,000
1881-1890	1,059,892,000
1871-1880	1,150,854,000
1861-1870	1,263,015,000
1851-1860	1,332,981,000
1841-1850	363,928,000
1831-1840	134,841,000
1821-1830	94,479,000
1811-1820	76,063,000
1801-1810	118,152,000
Total	7,700,360,000



GOLD BRICKS OF THE ASSAY OFFICE VALUED AT $1,000,000

With the first year of the new century starting out with an estimated increase of 20 per cent over the most productive year of the past, who can say to what colossal figures the gold output of the twentieth century may not run? And will the economists and statesmen of the future have to consider the problem of a new basic money or standard because gold has be

pme too plentiful and cheap? The Jnited States is not only becoming the greatest gold producing country in the world (including Alaska our territory), but it is the country to which gold most naturally and freely flows by a law of commercial gravitation. Foreign nations have to replenish their gold supply by artificial means. Now that the finances of the United States are on a sound basis gold is flowing to America in a steady stream. It is a remarkable fact that 19,-



JOHANNESBURG GOLD MINE.
Showing stamp battery where the ore is crushed.

000,000 Australian coined sovereigns are now reposing in the government's vaults in this country. They were shipped straight from the Australian mints to the United States in payment of balances which Australia owed London and London owed this country.

It is also a fact that, commercially considered, nearly the entire gold output of North America belongs to the United States and contributes to our circulation and resources. In 1890, 45 per cent of the world's output was produced in North America, and in 1901, after the South African mines have resumed their activity, 35 per cent of the world's production will still come from the mines of the United States, Canada and Mexico.

Canada is coming forward with great strides as a gold producer, thanks to the Klondike region, and the Canadians are vigorously agitating the establishment of a Dominion mint. At the present time the United States coins are used as the basic money of the Dominion, for a bank reserve and the like. Canadians naturally feel that they want a basic coin of their own.

World's Production of Gold as Figured by the Director of United States Mint.

	1898.	1899.
United States	$64,500,000	$71,000,000
Canada	14,000,000	21,000,000
Mexico	8,500,000	8,500,000
Africa	80,000,000	73,000,000
Australia	65,000,000	80,000,000
Russia	25,500,000	22,000,000
India	8,500,000	8,500,000
China	6,000,000	5,500,000
All other	15,000,000	17,000,000
Totals	$287,000,000	$306,500,000

	1900.	1901.
United States	$82,000,000	$94,000,000
Canada	25,000,000	30,000,000
Mexico	8,500,000	8,500,000
Africa	5,000,000	75,000,000
Australia	83,000,000	88,000,000
Russia	23,000,000	33,000,000
India	8,500,000	9,000,000
China	4,000,000	4,500,000
All other	18,000,000	23,000,000
Totals	$257,000,000	$265,000,000

COPPER MINING BY HAND DRILLS IN THE MINES OF NORWAY.
A method replaced by machinery in this country.

GREAT STONE LATHE

Cutting Stone Into Columns—Cheap Method of Work—Run by an Engine—Saving in Work.

THINK of an immense block of granite and think of the amount of work that must be put upon it to convert it into a perfectly round, high-polished column. The machine which works this rapid transformation is the latest triumph in the industrial world. It is called a lathe, and the work that it has been doing since it was installed has demonstrated that it is a success. It renders possible of easy and inexpensive accomplishment construction that has heretofore been very difficult.

Machinery is the friend of man. Not only does it facilitate work and hurry it along, but it does the work much better, as a rule, than can be done by hand power. It would be a long and expensive labor to fashion a block of Aberdeen granite, and give it the smooth and beautiful polish which we admire, as seen in our public buildings.

The lathe was built in Philadelphia, and has been installed in the granite quarries at Vinalhaven, Maine, where columns of many sizes are being turned out for the Cathedral of St. John the Divine, New York City. In fact this machine was conceived and built for the

special work called for by the plans for this great new cathedral of the metropolis, which is to have no less than thirty-two granite columns fifty-four feet long by six feet in diameter, which will weigh when completed 160 tons each. In addition to this it will have innumerable columns of smaller dimensions.

In length the lathe that will perform this work is eighty-six feet, and when in working-order it weighs 135 tons. It has swings 6 feet 6 inches by 60 feet long, and it has eight cutters. Each tool takes out a cut three inches deep, the entire eight cutters reducing the column twenty-four inches in diameter at one pass over the stone.

What It Does.

The block of granite in the illustration weighs 310 tons; it is 67 feet long, 8½ feet high by 7 feet wide. The piece of granite to be cut is rough hewn at the corners by hand, in order that it may be placed in the lathe. Once in the lathe it requires about six weeks to turn out a finished column, dressed and polished. The tool that does the cutting is a circular disk of steel seven-eighths of an inch in thickness and ten inches in diameter. It has a V-shaped cutting edge, and is wedged on the mandrel and held tightly by means of a lock-nut. When the tool is in operation it is set at an angle to the axis of the stone being dressed. The entire stone revolves, and as it does so it imparts a rotary motion to the cutting disks, which are forced into the stone by means of the feed screw.

In this manner the tool splinters off the rock to any required depth, leaving a roughly chipped surface. When this shaping process has been completed there is attached to the tool posts in the same manner as the cutting tools a cup-shaped device holding hardened steel shot, by which the rough polishing is done. The final polish is imparted to the columns in much the same manner, but powdered emory is used in this operation.

When one considers the length of the blocks of granite handled, the idea obtains that there must be many supports to hold the weight while the stone is under treatment, but the fact is the entire weight of the stone is held by head and tail chucks, there being no intermediate supports. This tells in a sentence the quality of the material used in the construction of the lathe itself. When in operation the lathe is run by a fifty horse-power engine. It makes one and three-fourths revolutions a minute at cutting speed, and three revolutions at polishing speed. When the belt is thrown off and the machine runs free, it runs for nearly a quarter of a minute, a fact which shows how well balanced it is. The lathe was first placed in operation in August, 1900.

FAMOUS STAGE SETTING FOR "THE SUNKEN BELL" AS PRESENTED BY E. H. SOTHERN AND VIRGINIA HARNED. IT IS SAID TO BE THE MOST EFFECTIVE AND COMPLICATED STAGE SETTING IN EXISTENCE.

QUICK SILVER.

Mines Found In Texas—Ore Is a Brilliant Red Rock—Roasting the Ore—Miners Often Suffer.

NEWLY discovered quicksilver mines in Texas have begun to yield large quantities of the valuable mineral, which hitherto has been obtained only in California. The ore which yields quicksilver is a brilliant red rock known as cinnabar, and when of high purity is vermilion in color. This rock is the original source of the pigment known as vermilion. It is a compound of sulphur and quicksilver, and to obtain the latter the rock must be roasted to separate the sulphur. When this is done the mercury passes off in the form of gas, is collected and afterwards condensed. Then it flows out in a continuous stream like a pencil of molten silver.

The discovery of the veins in California came about by noticing the peculiar vermilion frescoing on the bodies of the native Indians, and learning where they obtained the pigment. Occasionally mercury is found in its pure state, as when a miner accidentally strikes his pick into a little cup or basin of the fluid. Miners suffer a great deal from the poisonous fumes of quicksilver, and must necessarily be very cleanly to avoid sickness, while many use strong lemon juice to counteract the bad effects.

SMUGGLING—HOW IT IS DONE.

Three Classes of Smugglers—Punishment Inflicted by Law—Methods of Offenders—How Guilt Is Detected.

ONE of the most clever frauds against which the United States Treasury Department has to protect itself is that of smuggling. Countless schemes have been originated and brought into play by which the government is beaten out of thousands of dollars in revenue annually. A great staff of detectives is employed constantly by the authorities, but despite their vigilance many persons succeed in getting dutiable goods through the ports. The day is past when the "low-lying rakish craft" of the yellow-covered story book engaged in the trade, and now it is the first-class liners which provide means of transportation for such law-breakers.

Strictly speaking, these smugglers may be divided into three classes. First, there is that host of honest, law-abiding, honorable men who return from foreign ports with many valuables, dutiable souvenirs

and goods which they have purchased. Most of these are in utter ignorance of such a thing as a customs law, and never think of it when they are bringing the goods home with them. They bought them abroad simply because they could get them cheaper than in America. These people are surprised and pained when the entrance of their purchases is challenged.

Willing to Defraud.

The second class includes those who are aware of the custom laws, but are willing to take a chance of saving a few dollars by the purchase of goods in foreign ports and smuggling them into this country. Evidently they believe such laws are a species of partisan legislation, and that it is perfectly justifiable that they should evade them.

The third class, which has the least followers, is comprised of what are known as "professional smugglers." This class attempts to do regularly and on a wholesale plan what the second class does perhaps once in a lifetime. The contraband articles of the first class are usually a bit of lace, a precious stone, a quantity of gloves or cosmetics which the possessor wants for future use. With the other it is a business pure and simple.

The punishment provided by law is severe. In addition to the confiscation of goods, both fine and imprisonment may follow. The task of detecting these offenders is very arduous. When five or six hundred passengers cross the gangplank of an ocean liner several revenue officers are stationed about the landing. They closely scrutinize the countenances of the passengers, and so well have they cultivated the art that even a quick glance of the eyes does not escape them if it has a meaning behind it.

Detecting Smuggling.

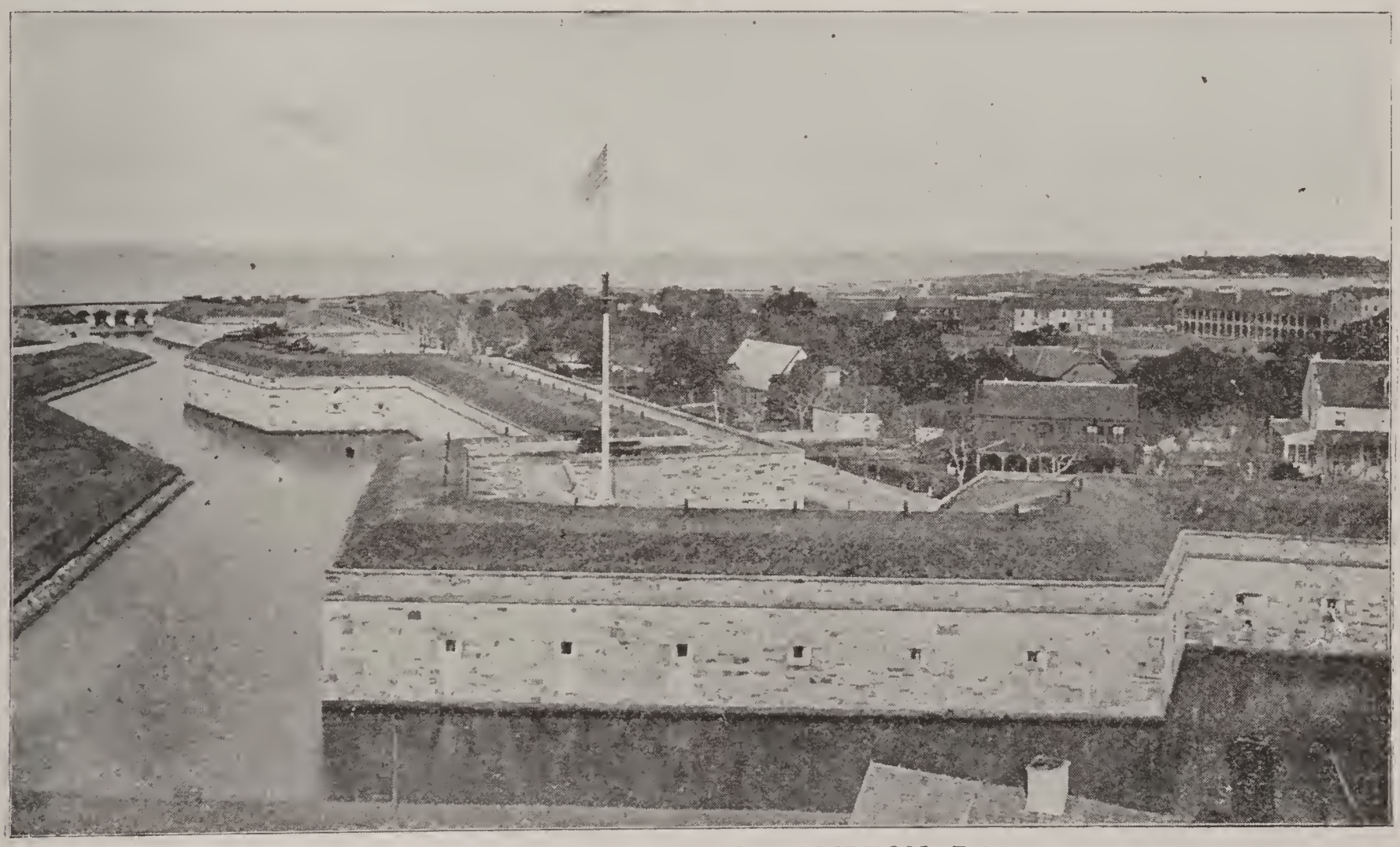
If a man descends with a slight swelling in his waistcoat pocket he may be intercepted and forced to submit to an investigation by the officers. Precious jewels are secreted in divers places on a man's person. In one case a double vest concealing many silver watches was detected. Another time a man was discovered to be much broader about the waist and chest than he really should be. Upon investigation it was found that several yards of very valuable lace were twined about him. Women are also great offenders. Costly jewels have been concealed by them in their bosoms, also laces and other valuables have been secreted on their person. In one instance a man was noticed to limp when descending the gang plank. He was searched, and a large diamond was found between his toes. False bottoms in trunks and telescopes also cause the government officials much trouble. Thousands of dollars worth of valuables have been found under layers in innocent-looking telescope trunks.

PATROLING THE OCEAN.

Work of the Hydrographic Office—The Skipper Recording Observations—Value of Bottles Cast Overboard.

THE ocean has become as minutely surveyed and in its elements as closely tabulated as the land. In its more traveled parts, and frequently in other parts it is being constantly and systematically observed and noted in all its winds, currents, temperatures, depths and obstructions, transient or permanent; and from the records thus obtained the shipmaster is able to lay out his course with great knowledge and precision.

On the wall of one of the rooms of the Hydrographic Office, in the Navy Department building at Washington, hangs a blank chart. It is a large blackboard on which are drawn in outline all the oceans of the world, with the continents which divide them traced between. The parallels of latitude and the meridians of longitude are shown. Starting at various points in the oceans and running over the surface are many irregular lines traced in chalk. At the end of



THE NEW FORTRESS MONROE, IN HAMPTON ROADS, VIRGINIA.

It is the largest of its kind in the world, although not up to date in defence.

each of these lines is stuck a pin, from which is hung a little green tag.

These tags and pins are removed at frequent intervals during the day by an official of the department, the corresponding outline is continued further across the chart and the pin and tag placed at the new termination of the line. On each tag is the name of a derelict vessel that is known to be floating free in the ocean, and the lines represent the course which the derelict has been pursuing, the tag marking the point at which she is reported to the office as having been seen last. On another chart hanging on another wall are lines indicating the tracks of bottles cast overboard and allowed to drift for the purpose of showing the trend of ocean currents. These lines are extended or amended according to information received by telegram or letter.

Other charts show the progress of cyclones, the position and drift of icebergs, the position of waterspouts, the temperature of surface water, the movements of the Gulf Stream, the peculiar aberrations in the audibility of fog signals, the growth of fog banks, the peculiar formation of clouds, etc.

THE EDDYSTONE LIGHTHOUSE.

Built on rock out in the ocean, off England's coast, and defying the powers of the waves and storm. The structure is made of steel.

Work of the Skipper.

When a vessel starts out on a voyage the Hydrographic Office furnishes the captain two small blank books containing forms to be filled in. There is a leaf for each day. One book is a general weather report, the other is a supplementary storm log. All observations are taken at Greenwich noon and recorded in these books. By means of his chronometer and by making observations, the seaman can calculate Greenwich noon to the moment. It is from these books that the daily chart of the ocean is prepared.

The questions asked concern the time of observations; the latitude and longitude; the true direction and force of the wind; the state of the barometer; the temperature of the air and of the surface water; the forms of clouds and the direction of their movements; the state of the waves and the direction in which they are running; the estimated current for

twenty-four hours; the weather experienced for twenty-four hours; the apparent periodic time, or intervals, in seconds, between the crests of successive waves as they pass; the true direction from which they come, and the ship's true course and speed at the time; the estimated heights of the several waves, from hollow to crest; the depth of the sea where the observations are made, or at least the exact position of the ship so that the depth may be obtained; information concerning fogs; general description of electric phenomena, and any experience in using oil to prevent heavy seas from breaking on the vessel. In the books are diagrams in which the captain may indicate the exact position of clouds and their height above the horizon.

These books reaching the Hydrographic Office, the reports for each day are grouped and collated, and the balances and averages thus set down on a chart. Captains of vessels are also provided with a number of bottles with a printed form for each covering the time and place at which the bottle is cast overboard. Blanks are left for the entry of the time and place the bottle is recovered, if at all.

FORTIFICATIONS OF GIBRALTAR AT THE BASE OF THE GREAT ROCK

These have been built by England, and not only guard the rock but the entrance to the Mediterranean. Gibraltar is supposed to be impregnable.

These bottles prove one of the most fruitful sources of information to the Hydrographic Office.

Derelicts and Icebergs.

A computation made by the Hydrographic Office shows that 1,628 derelicts were sighted upon the North Atlantic ocean within a period of seven years. Of this number 482 were identified. The average number sighted is 232 a year,

or nearly twenty a month. In 1893, 413 were sighted, an average of thirty-five a month. As the average term of survival for a derelict is one month, it is estimated that at least nineteen must be constantly floating over the North Atlantic Ocean. There are more derelicts sighted during September, October and November than during other months of the year.

The charts show that most of the derelicts have been sighted in the Gulf Stream off the coast of the United States north of 30 degrees north latitude and west of 60 degrees west longitude. The number gradually decreases toward the eastward, along the routes of transatlantic steamers. About fifty ocean-going vessels are known to have collided with derelicts in the North Atlantic within a period of seven years.

Icebergs are a menace at sea, there being danger of colliding with them at night. According to observations made by the Hydrographic Office great accessions of icebergs come in cycles, there being years during which few or none are sighted, and again years when the number is great. From 1891 to 1895 numerous icebergs were sighted, and also during the year 1898. Waterspouts are a source of danger at sea. Specifically, a waterspout is a whirlwind over a body of water, producing the appearance of a solid column of water extending from the surface to the clouds. In reality, the phenomenon that is seen is the cloud brought down to the earth's surface by the rapid gyratory motion of a vertical whirl. At first the cloud has the form of a tapering funnel, but as it descends near the water's surface it draws up the water for a distance and imparts to it its whirling motion. The height of the spout depends upon the hygrometic state of the air; in general it is between 800 and 2,500 feet. Waterspouts are most frequent in tropical and equatorial regions.

SHIPS AND ICEBERGS

NIAGARA FALLS.

Beauty of the Falls in Winter—Will Have Disappeared in Two Thousand Years—Annual Horse Power.

ICE forms at Niagara Falls each winter 100 feet thick. Much has been said about the wonders and impressive solemnity of the falls in the summer months, but to realize the great works of nature at that spot one must visit the world-renowned spectacle in the winter. When the thermometer is below zero is the time to visit one of the greatest sights in the world. The rocks, the trees, the shrubs, have all disappeared, and in their stead one finds monstrous ice formations, trees staggering under the weight of massive collections of frozen vapor, and rocks which present the appearance of small ice-clad mountains.

Regardless of the scenic effect the famous ice bridges of Niagara are the most interesting features of a visit to the falls. Weeks of severe cold weather are accountable for the formation of these bridges. The ice in Lake Erie flows down with the current in great bodies after it melts from the effects of a few days of sun. As it reaches the river its speed is accelerated. Then it reaches the current proper, and is hurled through the rapids at marvelous speed.

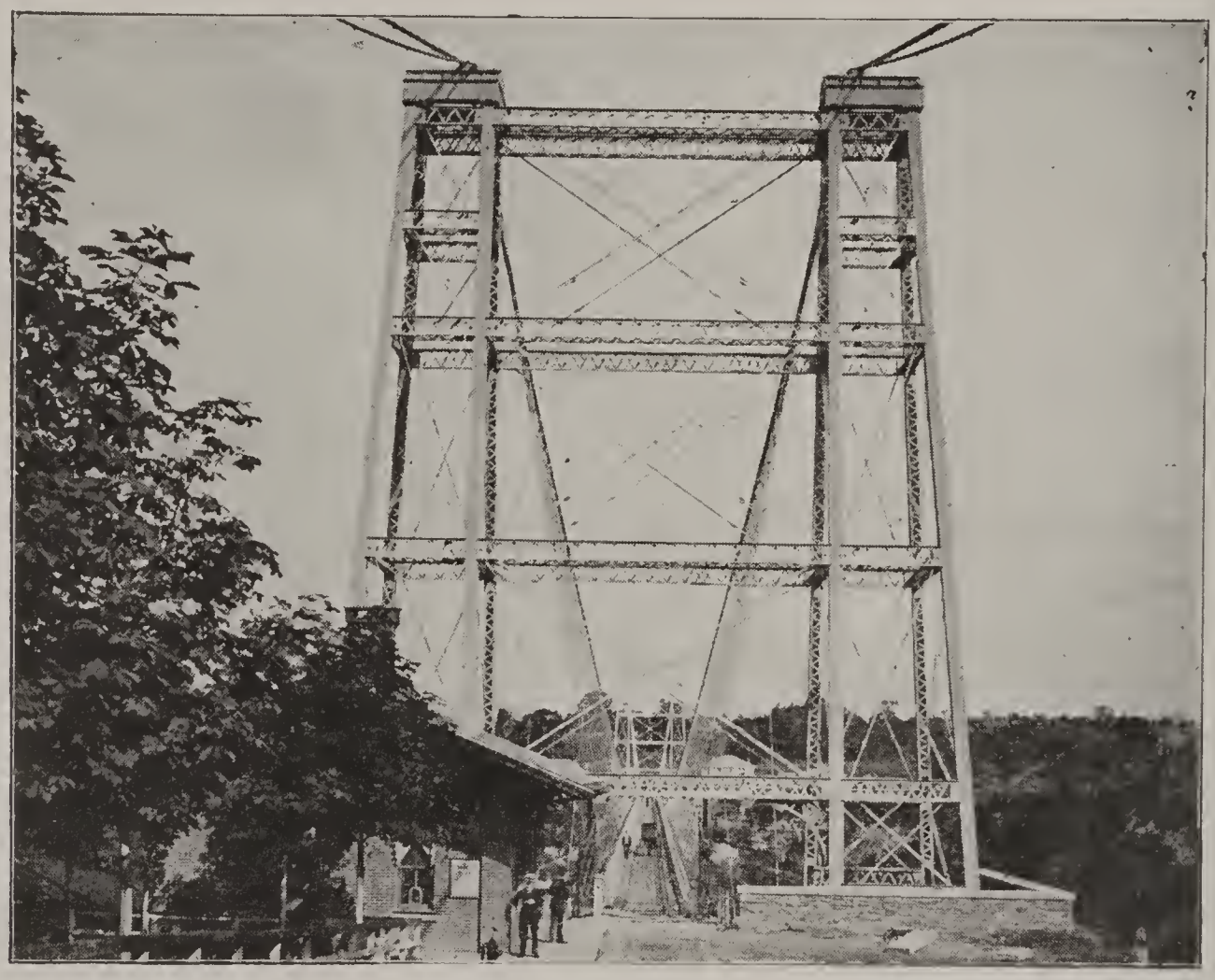
When large floes come down the river the ice gathers in great quantities on the reefs and bars above the falls. In many winters the direction of the current of the stream has been diverted entirely. Sometimes it is made possible for persons to cross on the ice formations, and points which are seldom accessible on other occa-

NIAGARA SUSPENSION BRIDGE.

Looking up from the river which itself comes from the famous falls.

sions have been reached by crossing on the ice bridges. At one time the ice formations so completely interfered with the flow of the stream that the water in the Niagara River was reduced to half its original depth. It remained so for a few days, when the formation broke and the water came rushing down again.

Persons watch for days the formation of these bridges in hopes of being the first to cross. It is a dangerous feat, but is risked by many. These feats are heralded all over the country, and the name of the first to cross the new bridge is recorded throughout the adjacent towns. In some instances, horses are known to have crossed from the Canadian to the American side in safety.



THE FAMOUS CANTILEVER BRIDGE OF NIAGARA FALLS.
Showing the American entrance and guard's cottage.

Falls Slowly Receding.

Niagara Falls were discovered in 1678. They have receded in the last 175 years 76 feet from where they originally were. Their height at the American falls is 164 feet, at the Horseshoe 158 feet. The average recession of the falls or breaking away of the rocky front over which it dashes is about 2.5 feet per year. Below the falls the descent of the river is 15 feet per mile. Their width at the American falls is 600 feet, at the Horseshoe 1,800 feet. The amount of water which passes over them is 270,000 cubic feet per second. They receive their entire water supply from the Great Lakes and the water sheds about them.

Scientists have calculated that at the present rate at which the falls are crumbling away they will pass out of existence in about 2,000 years. They are now used extensively for the development of electrical horse power. Electrical works have been erected at the base of the falls for the development of horse power. It is estimated that 8,000 horse power per year is thus secured. This is distributed

to neighboring cities and sold on the basis of $25 per horse power per year. In connection with the formation of the falls, geologists have discovered that at one time the waters of the Great Lakes flowed into the Mississippi River and the falls did not exist. Subsequent upheaval of the earth created the continental divide at Summit, twelve miles from Chicago, and after that the waters of the Great Lakes worked their way eastward and formed the famous falls.

PROVISIONING AN OCEAN LINER.

Capacity of Modern Ocean Liner—Game in Great Demand—Jellies and Sweets Consumed.

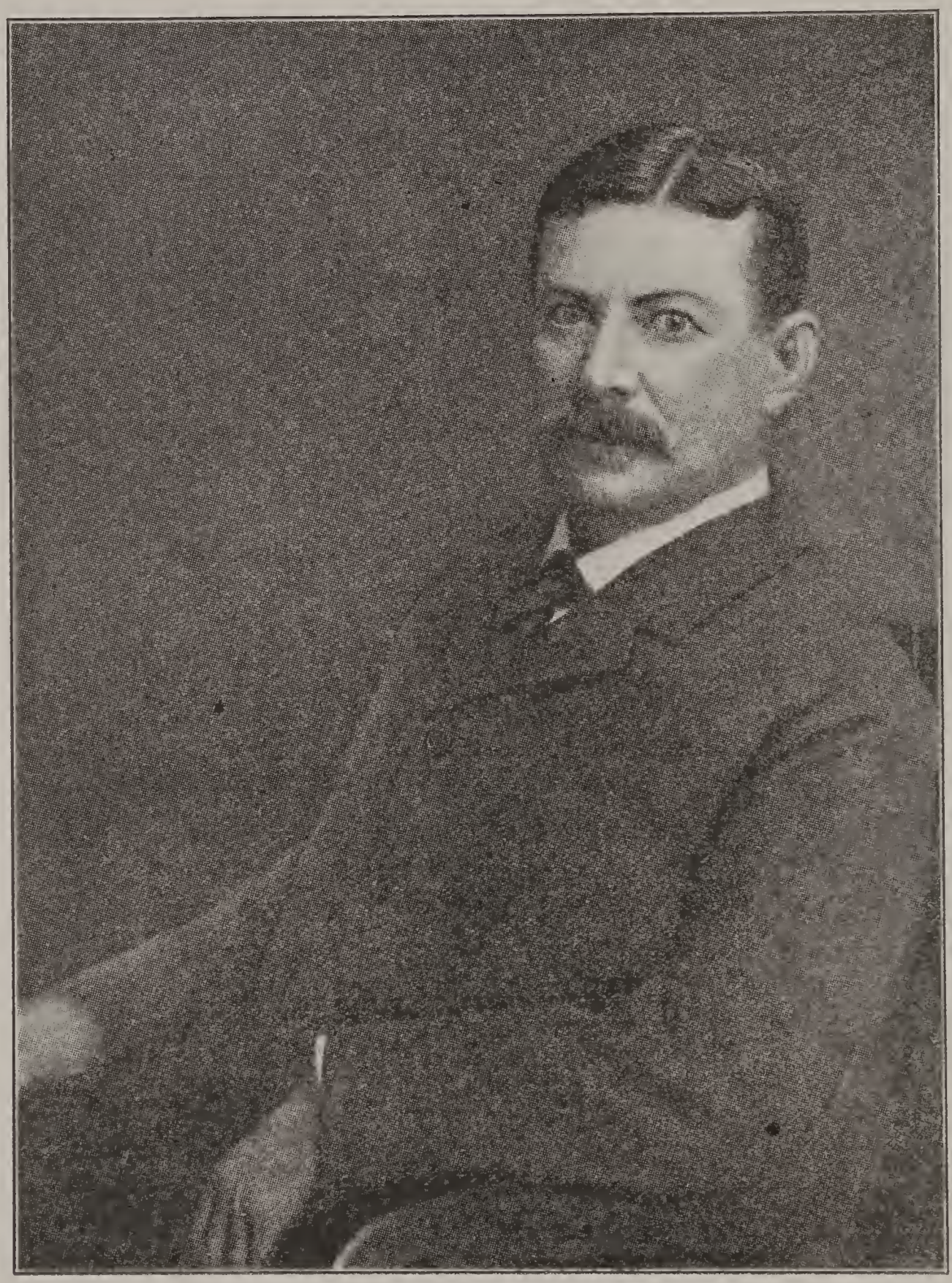
PROVISIONING an ocean liner of the modern type is one of the greatest wonders of twentieth century steamship transportation. It would be impossible for an uninformed person to estimate the amount of provisions which must be put into one of these vessels for a round trip from the United States to Europe, covering a period of twelve days—six over and six back. Before trying to make any calculations the number of passengers carried by one of these sea monsters must be considered. Taking one of the most modern type as a criterion, the following facts and figures will give the reader some idea of the magnitude of the enterprise. The passenger capacity of one of these floating palaces is usually 2,000 persons, not including the crew and other employés attached to the vessel. She will carry 350 saloon passengers, 275 second cabin, and 1,000 third class, with a crew of about 450, 150 of whom will be in the steward's department. So much for its capacity for human freight.

The amount of bread consumed on a voyage is startling. The total amount of flour stored for bread and pastry is 200 barrels. As the gross weight of a barrel is 220 pounds, the weight of this alone is 39,200 pounds or 17½ tons. Meat is also a great factor in an Atlantic trip. In the old days live stock was carried and killed as needed for the table. But since the process of cold storage has been successfully demonstrated it has done away with the old custom and saved much needed space. Great refrigerators are provided which will keep in first-class condition thousands of pounds of fresh meats for several days. In these compartments are stored 20,000 pounds of fresh beef, 10,000 pounds of mutton, 14,000 pounds of lamb, 500 pounds of veal, and 500 pounds of pork.

Game in Demand.

The demand for game in season, especially among first cabin passengers, is enormous. To provide for this the steamship company lays in a stock which far exceeds that of the greatest hotels in the country. The capacity for poultry and game is 5,070, apportioned as follows: 1,500 spring chickens, 500 capons, 200 roasting chickens, 300 fowls, 500 duck-

lings, 50 goslings, 120 turkeys, 200 pheasants, 300 partridges, 800 squabs, and 600 quail. This amount is consumed chiefly by the saloon, second cabin passengers and superior officers, so the supply is abundant. These solid comestibles are, however, flanked by large quantities of toothsome fish; 3,000 pounds of fresh fish of various kinds are provided, besides 2,500 pounds of salt fish. The herring is also in great demand, and 30 barrels of these—15,000 in number—are in the refrigerators. Besides these are 50 boxes of smoked fish, 500 pounds of lobsters, 400 tins of sardines, 500 pounds of turtle, 20,000 oysters, 10,000 clams.



WILLIAM H. MOODY
SECRETARY OF THE NAVY

Eggs are consumed to the number of 25,000. If a hen should lay one egg every

day in the year, in order to furnish enough for a ten-day trip, she would continue to lay at that rate until 1967. This number of eggs represents the combined annual output of 277 hens. A trifle over 2,500 pounds of oatmeal is carried on a trip. Most of this goes to the steerage passengers. Of ham and bacon, 5,000 pounds—more than two tons—are necessary to appease the appetites of lovers of such food.

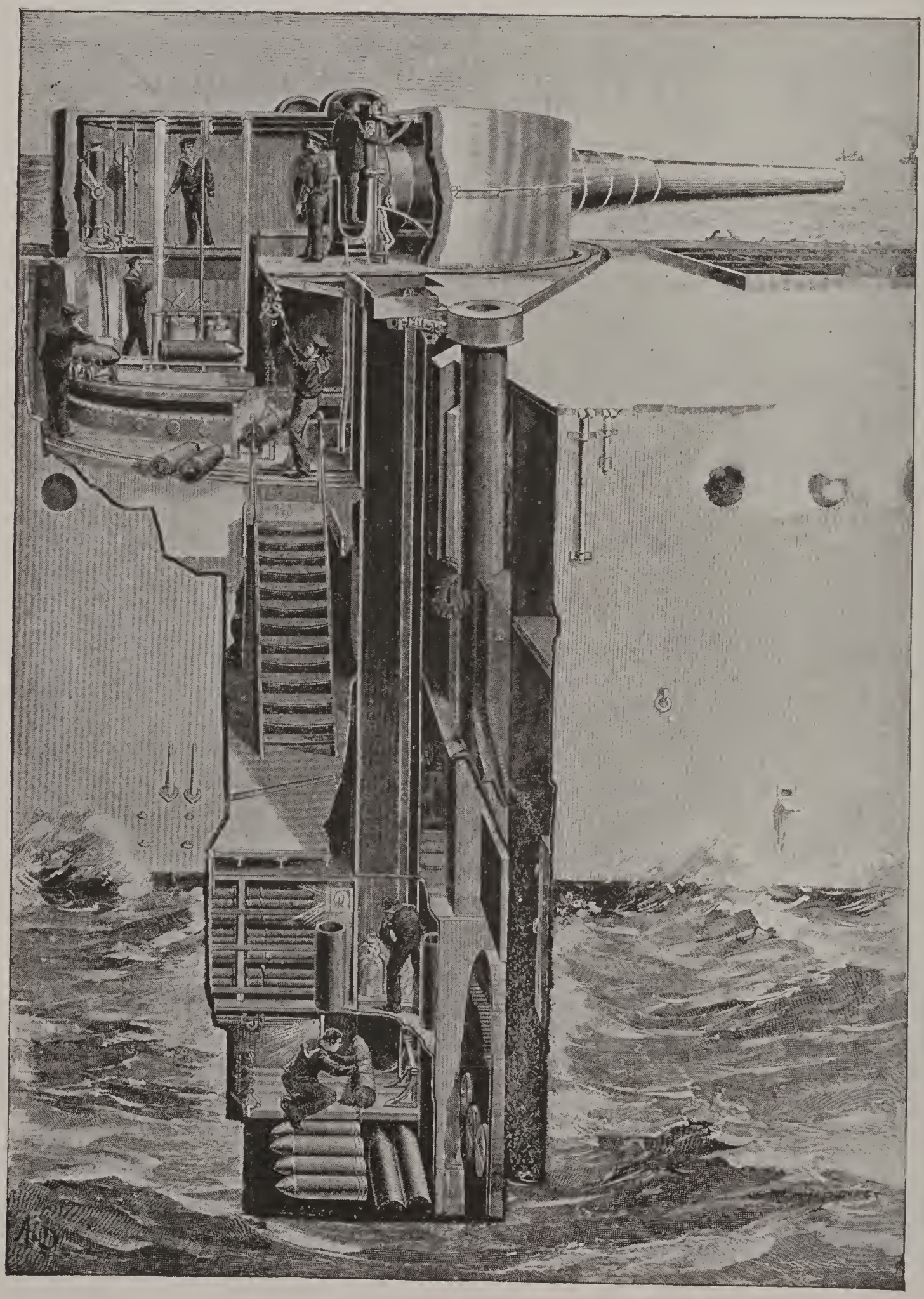
Butter, jams, jellies and marmalades cut a great figure in provisioning a vessel. The total amount of butter taken on for a voyage is 5,000 pounds. Despite seasickness, 5,000 pounds of jams, jellies, and marmalades find their way to the table in various forms. Ten thousand pounds of

EUGENE HALE OF MAINE.
Chairman of the Senate Committee on Naval Affairs.

sugar, or nearly 4½ tons, go to sweeten edibles and drinks to the tastes of the passengers. Two thousand five hundred pounds of coffee and 1,500 pounds of tea are laid in store for the round voyage.

Amount of Milk Consumed.

A small lake of milk is always on hand. The steward provides 800 gallons of the liquid, which is put through a sterilizing process in order that it will not sour on



SECTIONAL VIEW OF A BATTLESHIP, SHOWING TURRET AND AMMUNITION HOIST.

the trip. In the old days immigrants and other passengers suffered from scurvy and other diseases owing to a want of vegetables. This has been overcome as provisions are now made by which such perishable goods are preserved for days. Forty-six tons of potatoes form another important factor in the domain of the steward.

There are 250 coffee and tea pots, 100 butter dishes, 200 sugar basins, 250 vegetable and entrée dishes, 10,000 pieces of china, for first and second class passengers, and 3,600 plates and 1,500 cups for third class use. In the course of the year—about ten round voyages—the principal items of provisioning would total up as follows: 62,000 pounds of butcher's meat, 50,700 poultry and game, 200,000 oysters, 250,000 eggs, 15,000 pounds of tea, 25,000 pounds of coffee, 200,000 oranges, 50,000 pounds of butter, and 2,000 barrels of flour.

COST OF A NATIONAL ELECTION.

The National Committee a Business Organization—Collection and Disbursement of Funds—Amount of Money Expended.

IT cost $600 to nominate Abraham Lincoln for President, and $7,000,000 to elect William McKinley President of the United States. These figures represent the growth of political campaigning in thirty-six years into a great business with a perfect system of organization. The total expenses of a political campaign in which a President and high State officers are elected exceed the entire cost of the federal government for the first few years of its existence. Chairman Gorman of Maryland and Senator Quay of Pennsylvania are the men who, as chairmen of the national executive campaign committees of the democratic and republican parties in 1884, introduced into American politics the present system of conducting national campaigns by means of thorough organizations throughout the country and the expenditure of vast sums for speakers, literature, music, and other spectacular features.

The business affairs of the great political parties are intrusted to national committees, composed of one member from each State and Territory, who are elected by the delegates to the national conventions at the time the conventions are held. The chairman of the committee is always the choice of the nominee for President, and in the power of this chairman rests the entire campaign.

National headquarters are opened soon after the candidates are nominated. Committees are appointed, and the principal work—that of getting money—is begun immediately. Circular and personal letters are sent out to strong men and great corporations. Many of these corporations contribute to both funds, so that they may have supporters no matter which party is elected. Because of the civil service regulation no money is supposed to be raised by assessment. Everything is given as a donation, in theory at least. No books are kept, and the ex-

penditures are known only to the chairman of the committee. The bulk of the money, however, is turned over to the treasurer.

a staff of expert political writers is employed to compile facts and figures from the records of Congress. The greatest book or publication is the text book.

SENATOR M. A. HANNA.
Chairman of the Republican National Committee, 1896 and 1900.

Providing Literature.

The greatest task before campaign managers after the headquarters are opened is that of providing literature. Much stuff is submitted by outsiders, but This contains many arguments in favor of the party, and also much information upon which speakers base their addresses. Over one million of these are printed by each party within a month. More than $250,000 is spent in printing this literature

for one party, and the cost of distribution is equally as much.

Another department under the supervision of the chairman of the national committee is the "speakers' bureau." Many prominent senators, congressmen, and other politicians of note volunteer their services to the cause for a number of speeches wherever the party desires them to go. They receive no compensation, but the headquarters stand for their traveling expenses. Then there is what is known as "spellbinders." These are paid to make speeches, their salaries ranging from $500 a speech to $100 per week. Their speeches are usually censored before delivered. An army of orators is in telegraphic communication with headquarters daily. They report how they were received at towns along the road and other incidents which may prove of interest to the managers.

Handling the Press.

There is the press committee. This deals with editors of small papers who demand a compensation for their support of the party. They come into the office, state the circulation and influence of their paper, and offer to give the party advertising and support for a fixed sum paid in advance. After a little talk, this is granted if the price, which is five or six times regular advertising rates, is not too great.

By August all these preparations have been completed. The "straw" calculations are then made. Experts and canvassers are employed in all districts to find how the voters stand. If favorable to the cause pamphlets are published stating the number of votes "which will be cast on election day." These are not merely guesses, but are compiled with great accuracy. If unfavorable districts are reported the work of the committee is doubled in that doubtful territory.

When the party has money on hand the expenditures of a day amount to more than $50,000. Besides this amount an emergency fund is put away by the chairman of each national committee, the amount of which only the chairman knows. This sum amounts sometimes to $50,000,000, and other times $1,000,000. A secret service system is also part of the great organization. Special detectives are hired to find out the condition of doubtful districts, and reports are made to headquarters. The money expended by the national committee is but a small part of the expenses of State campaigns and elections throughout the country. In the larger States each party organization spends from $100,000 upwards to $1,000,000 working for the election of the State ticket. The expenditures in large cities are enormous, and the expenses of thousands of candidates throughout the country cannot be ascertained. The cost of the political campaign of 1900 is reckoned at about $25,000,000. The major portion of the cost is borne by people who live or profit by the business of politics.

THE BIGGEST BIRD THAT FLIES.

Attains the Greatest Heights Possible—Carnivorous Appetite—Keen Power of Sight—Other Big Birds.

THE ornithologists of Great Britain and America have decided that the largest bird that flies is an American bird, the great condor of the Andes. To another bird, which is American now, has been given the second prize. It is the fierce, harpy eagle of the Philippines. Our own turkey comes near the second place, and if England succeeds in her attempt at reintroducing the famous great bustard into the tight little island, it will have the next largest bird to our turkey.

In the United States we have, besides the turkey, four other birds which are ranked high in the list of the largest flying birds. They are the beautiful golden eagle, the national bald-headed eagle, the great wild swan, known specifically as the whooper, and the California condor, which is almost as large as his South American brother. In many respects the South American condor is the most remarkable of all living creatures. No other bird can fly so high. Humboldt saw one flying over Chimborazo at a height of over 23,000 feet. It seems to fly as easily and breathe as easily in the rarefied atmosphere at that great height as it does at the level of the sea. No other created being can do this, as no other living creature can lift itself so far above the earth. When flying, it sails in majestic circles or hangs poised in the air as if suspended there by an invisible cord.

Darwin once watched a condor for half an hour as it hung over an Andean valley, and never once did he detect the slightest movement in the great bird or its widespread pinions. Its home is above the snow line, and it chooses as its favorite dwelling places where great cliffs descend sheer down for thousands of feet. It wanders sometimes to where the cliffs of Patagonia frown over the troubled seas, but prefers to seek its food in the mountain valleys. It is a bird blessed with an appetite as remarkable as itself, and one condor has been known to devour a calf, a dog, and a sheep in a single week. On the other hand, it can go without food for more than forty days.

Keen Power of Sight.

Probably no other created animal has such keen sight as the condor. From tremendous heights and from great distances it can spy a carcass, and will swoop down on it with the rush and speed of the wind sweeping through the mountain gorges. Though a good-sized condor measures fifteen feet in its expanse of wing—condors have been shot with that spread—there seems to be no authentic record of the weight of a condor of that size. The weight of the bird is estimated by good authorities, however, at about forty pounds for one with a fifteen-foot spread of wing.

In putting forward the claims of the

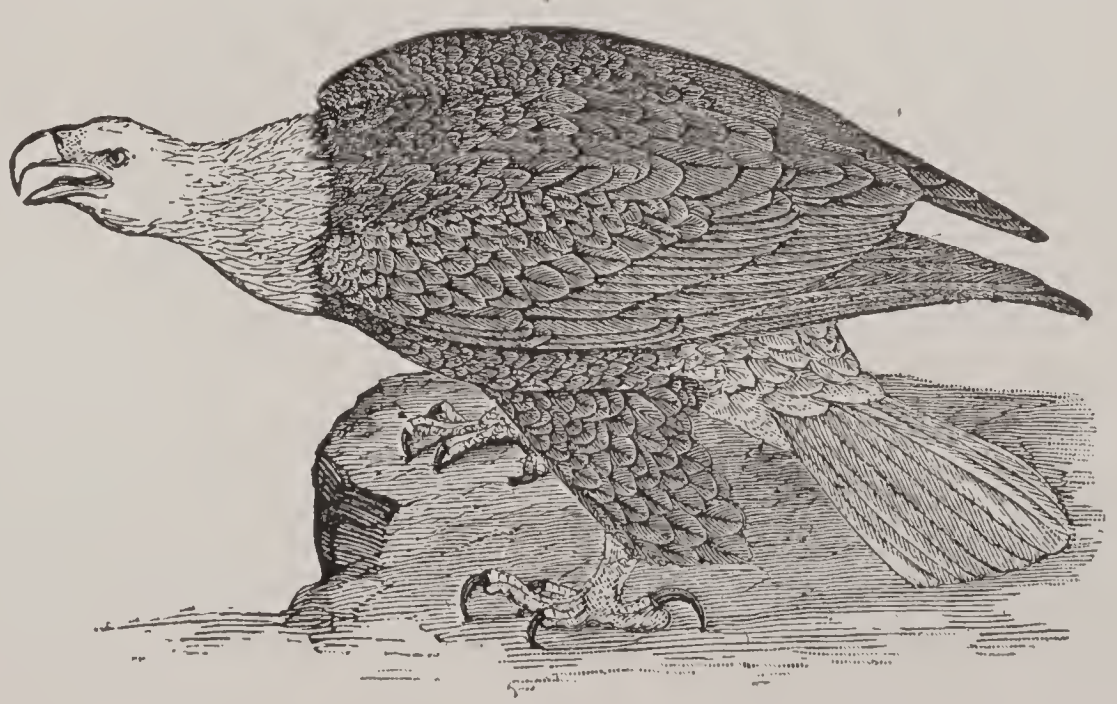
turkey to be the third largest bird that flies, if not the second, the tame as well as the wild bird must be taken into consideration, for the domestic turkey certainly can fly, and sometimes ascends to the "tipmost top of the tallmost trees," though it is not so lively on the wing as its wild brother. Benjamin Franklin wanted to have the turkey adopted as the national bird of the United States instead of the eagle, and made out a good case for the bird as against the claims of his successful rival. Why the bird in question is call a turkey has been much discussed without reaching any definite conclusion. One theory is that the turkey names himself by his peculiar "cluck," which sounds like "turk, turk, turk."

Weight of Eagles.

There is a splendid specimen of the harpy eagle in the Washington Zoological Park, which weighs between twenty-eight and thirty pounds. When it is considered that the golden eagle weighs only twelve pounds, the sea eagle only sixteen pounds, and the Spanish imperial eagle only a little over ten pounds, it will be seen that the harpy undoubtedly is entitled to be considered the largest of eagles, if not the second largest of flying birds. No measurements which can be accepted as exact scientific records have been taken by the ornithologists of the length of body and spread of wing of this great and fierce bird, but it is established that the bird has a spread of at least ten to twelve feet.

There are those who not only demand second place for the bustard, but are inclined to give him first place among the birds that fly. Even such an eminent authority as J. E. Harting, of London, seems to incline that way. But the biggest bustard Mr. Harting cites is the Seville bustard, with a weight of thirty pounds, and the biggest authentic spread of wings he cites is only seven feet three inches. The German naturalist, the younger Naumann, tells of bustards weighing thirty-two pounds, and says that he has been assured of the former existence of specimens of the bird weighing thirty-five or thirty-eight pounds.

In speaking of big flying birds, the wild swan should not be forgotten. This bird sometimes attains to a weight of twenty-five pounds, and has an expanse of wing of seven feet. The albatross sometimes weighs seventeen pounds, and has fourteen feet expanse of wing. The laemmergeier, the great bearded vulture of the Alps, is the bird told of most frequently in song and story as a kidnapper. As a matter of fact, it is doubted by the best authorities if the laemmergeier ever stoops to any but a carcass.



THE HAWAIIAN ISLANDS.

Beautiful Scenic Effects in the Islands—A Famous Precipice—Natives Believe in Education—Growth of the System.

THESE beautiful islands, the "Paradise of the Pacific," are located about 2,000 miles from California, nearly in the center of the Pacific Ocean, and just on the edge of the tropics. Enjoying, as they do, the combined advantages of the tropic and temperate zones, the climate is ideal—in fact, the absence of extremes of heat or cold is so noticeable that the natives have no word meaning weather. The climate is so mild and the soil so fertile that one writer says:

"One could live there yearly an existence of charming idleness upon the capital expended monthly in the cold latitudes of the United States for ordinary comfort."

There is little incentive to actual toil. So easy is life that it may easily become too easy. There are eight inhabited islands in the group, and a total area of nearly 7,000 square miles, the population numbering over 100,000. Honolulu, the capital, situated on the island of Oahu, has about 30,000 inhabitants, and is a city of great beauty. It has wide streets lined with palms, handsome residences embowered in trees, beautiful gardens filled with rare, strange plants, blocks of business buildings of the latest architecture, and all the accessories of modern civilization—gas, electric lights, street cars, schools, hospitals and public buildings. Honolulu, under the American flag and the influence of our social customs, is the most charming residence place in the world. The principal points of interest in the vicinity of Honolulu are:

Punch Bowl Hill, an extinct crater about twenty miles distant from the hotel, from whose summit, some five hundred feet above the sea level, can be seen all the surrounding country from Waikiki to Pearl Lochs, Diamond Head, the Waianae Mountains and Kapiolani Park, forming a beautiful panorama.

Mount Tantalus, in the rear of Punch Bowl Hill, rises 2,000 feet, and here are obtained the best possible views, embracing an area of more than fifty miles, and as the approaches to it are through beautiful groves, it is a most delightful trip. Continuing on to Mount Konahuanui, which is 4,000 feet in height, the eastern side of Oahu can be seen, also the Koolan villages and bay.

A Famous Precipice.

The Pali, a famous point, six and one-half miles distant from the hotel, can be reached easily either by carriage or saddle horse. It is some 1,200 feet above the sea level, ascending very gradually, with the mountains on either side lifting their peaks 3,000 feet high, and when the last hill has been reached the view is sublime; while to reach the summit one passes through a gorgeous array of ferns. plants

and shrubbery of all varieties known to the tropics. It was here that King Kamehameha took such terrible vengeance upon his foes, driving them over the edge of the precipice, a fall of 500 feet.

Waikiki, a fashionable seaside resort where many of the residents of Honolulu have their summer homes, is a charming spot and a favorite place for turf bathing and aquatic sports, for which the natives are famous.

HAWAIIAN CHILDREN IN BATHING.
A tropical foliage scene.

Great interest has been manifested by educators in this country in the schools of Hawaii. Hawaii provides for education upon the principle that all classes, whether citizen or alien, are entitled, without condition, equally and alike to the benefits of state education; a principle that contemplates a single system of schools, with equal privileges, open and accessible to all. Following this up and developing a school system upon it there is already provided the Lahainaluna school of manual training; the Armstrong Institute, an association of teachers for the introduction of industrial work in the schools; a series of agricultural lectures for the benefit of all classes; a reform school, located at Waialee, having the use of 733 acres of ground; the Honolulu Normal and Training School; a summer school and kindergartens.

During the latter part of 1899 one twelve-room school and one three-room school were erected on the island of Oahu; twelve new school structures on Hawaii, one on Maui, an addition to the school on Kauai. The buildings are by no means as expensive as those erected in

the United States, and as a rule have only from two to three rooms. The general school laws of the islands first came into effect in 1840, but were not of practical effect until after the Ricord legislation of 1846. The real development of the school system commenced in 1847 under Richard Armstrong, a son of Gen. S. C. Armstrong, famous in connection with Hampton Institute. Since his time, with many setbacks and many discouragements, the growth of the school system has been steadily upward and steadily toward American thought.

Inmates of Reform Schools.

The Honolulu High School is one of the institutions of the educational system which all Hawaiians feel proud of always. It is not accredited at any of the universities of the United States. The high school is especially adapted to the needs of those who speak the English language as a mother tongue. The royal school is being developed along the line of a polytechnic. In school statistics there is much of interest as to the character of the nationalties living in the island group. For instance, the number of inmates received in the reform school during 1898-1899 were 69. Of these 40 were Hawaiians, 8 part Hawaiians, 14 Portuguese, 2 Chinese, 1 Japanese, 2 American, 1 Italian, and 1 German.

The offenses for which they were committed were: Truancy, 26; larceny, 31; disobedience to parents, 4; assault and battery, 2; malicious injury, 2; accessory after fact, 1; vagrancy, 1; common nuisance, 1; and burglary, 1. The number of public schools in the islands are 141, private schools 48, making a total of 189. The number of male teachers are 192, and female 352; total, 544. The number of male pupils are 8,651, female 6,839; total, 15,490. Of these 11,436 are in the public schools. The nationality of the pupils attending school is:

Hawaiian	5,043
Part Hawaiian	2,7[illegible]
American	[illegible]0[illegible]
British	[illegible]13
German	337
Portuguese	3,882
Scandinavian	84
Japanese	1,141
Chinese	1,314
South Sea Islanders	30
Other foreigners	124

The people of Hawaii are proud of their school system, and what it has accomplished under disheartening circumstances.

DREDGING.

Various Kinds of Dredges—The Purpose of Each—Some of the Largest Dredges and their Capacities.

THE largest dredge in the world was invented in Chicago by Lindon Bates and is in use by nearly all foreign governments. Within the last few years great improvements have been made in dredges and dredging machines for excavating rock or earth below the surface of the water. The most common kinds are the clam-shell dredge, the dipper dredge, the continuous-bucket dredge and the suction dredge. Particularly adapted for excavations in very hard material like hard-pan and blasted rock are the dipper dredges. The clam-shell and bucket dredges work best in soft tenacious material like clay, and the suction dredge does especially good work in sand, silt and other soft material.

In 1899, in work on the Buffalo, N. Y., breakwater construction, was a clam-shell dredge of enormous proportions. Its bucket capacity was ten cubic yards, and it took material from a depth of from sixty to seventy feet under the water, when running full capacity, at the rate of 4,000 cubic yards a day. The bucket when empty weighed fifteen tons and held forty tons of clay. Its machinery was so powerful that it could handle one bucketful a minute under sixty-five feet of water.

Two large suction dredges have been employed on the New York Harbor improvements. They have steel hulls, and have force to pump sand through tubes at the rate of 40,000 tons an hour. The hoppers of each dredge have a capacity of 3,000 tons of wet sand. Each dredge measures 320 feet long, 47 feet 10 inches beam, 20 feet 6 inches deep; draft, loaded, 16 feet 4 inches. For pumping sand each dredge has two centrifugal pumps with sixteen-inch suction and delivery pipes, each pump being worked by triple expansion engines.

Enormous Bucket Dredge.

Employed at Karachi Port works, India, was a chain-bucket dredge 236 feet long, 42½ feet beam, 16 feet deep and of 1,250 ton hopper capacity. In Vladivostock harbor there was a chain-bucket dredge 162 feet long, 33 feet wide, 12½ feet deep. Its hull was of steel, and it could excavate 457 cubic yards of compact clay an hour. In work on the Volga River in Russia was a suction dredge made in two parts—to be worked combined as one large dredge, or separate. Each part was 216 feet long, 33⅓ feet wide, 9 feet deep and 4 feet 8 inches draught. They were propelled by electric power, and had a wonderful capacity. One of the largest dredges in America is a dipper dredge on the Great Lakes. It is 132 feet long, 42½ feet wide, 13½ feet deep, and has a dipper capacity of 8½ cubic yards. The weight of the dipper is

sixteen tons, and its capacity is from 5,000 to 6,000 cubic yards in a ten-hour day.

The Bates dredges, which have so far surpassed all others in size, were first used on Chicago's drainage canal. Later

OYSTER DREDGES AT THE WHARF, NEW ORLEANS.

The Gulf Oysters are fatter and different in flavor from Chesapeake Bay varieties.

the English government used them, and then the Russian. That they were invented by an American is another evidence of the progress of this nation.

Oyster dredging is most extensively practiced in the Chesapeake Bay near Baltimore, Maryland. There the finest oyster feeding grounds of the world are found. Oysters are gathered by the use of a system of drag dredges which are dropped into the bed of the stream in which the oysters feed and grow, and then drawn along by the boat to which they are attached above. When they are loaded they are lifted to the surface and their contents dumped into the boat.

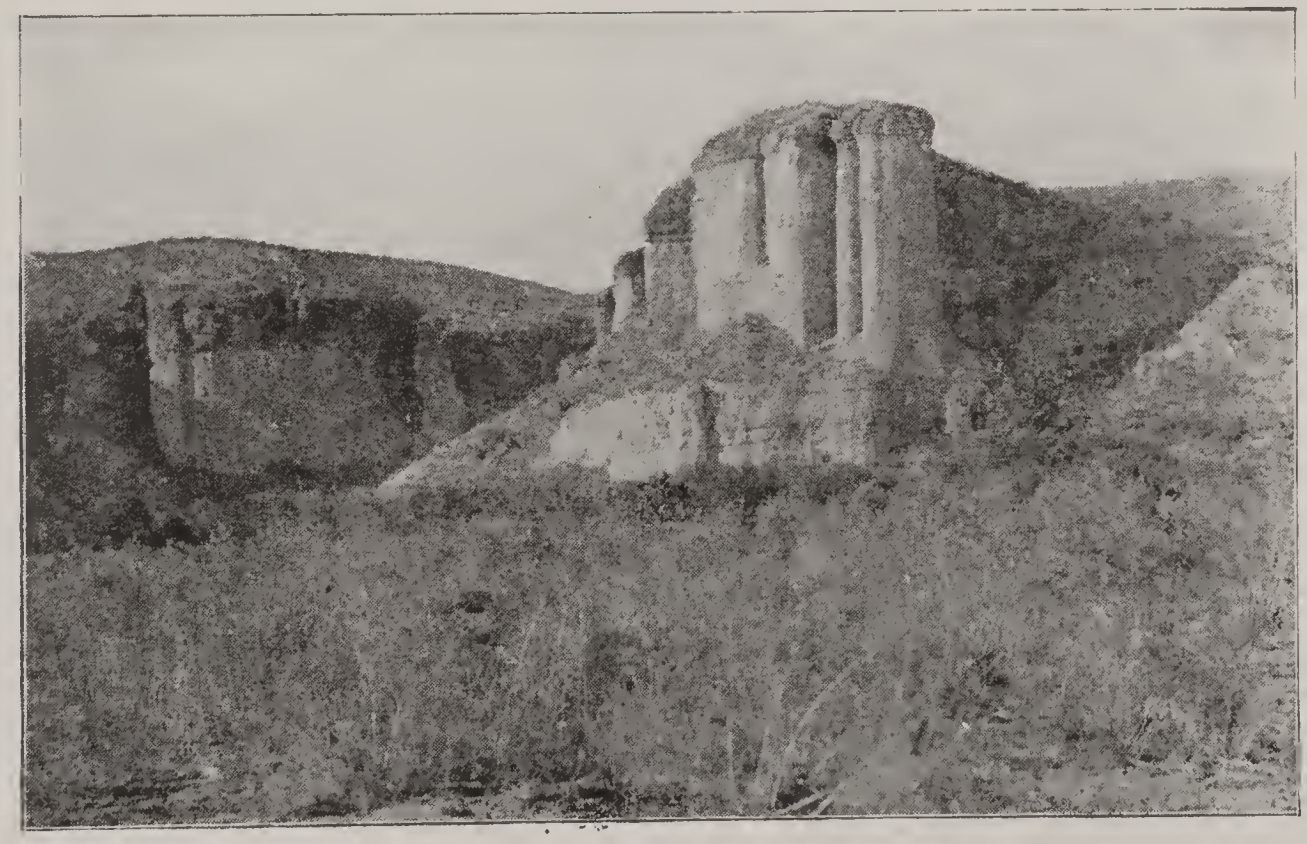
Government inspectors continually watch this work. Otherwise, through the carelessness or criminality of the oyster dredgers, the oyster itself would soon be exterminated. These government inspectors compel the dredge men to return to the waters oysters which have not reached a certain age. There are certain months in the year during which the dredging is not permitted, and the government patrols the oyster feeding ground with boats on which cannon are mounted.

Body Dredging.

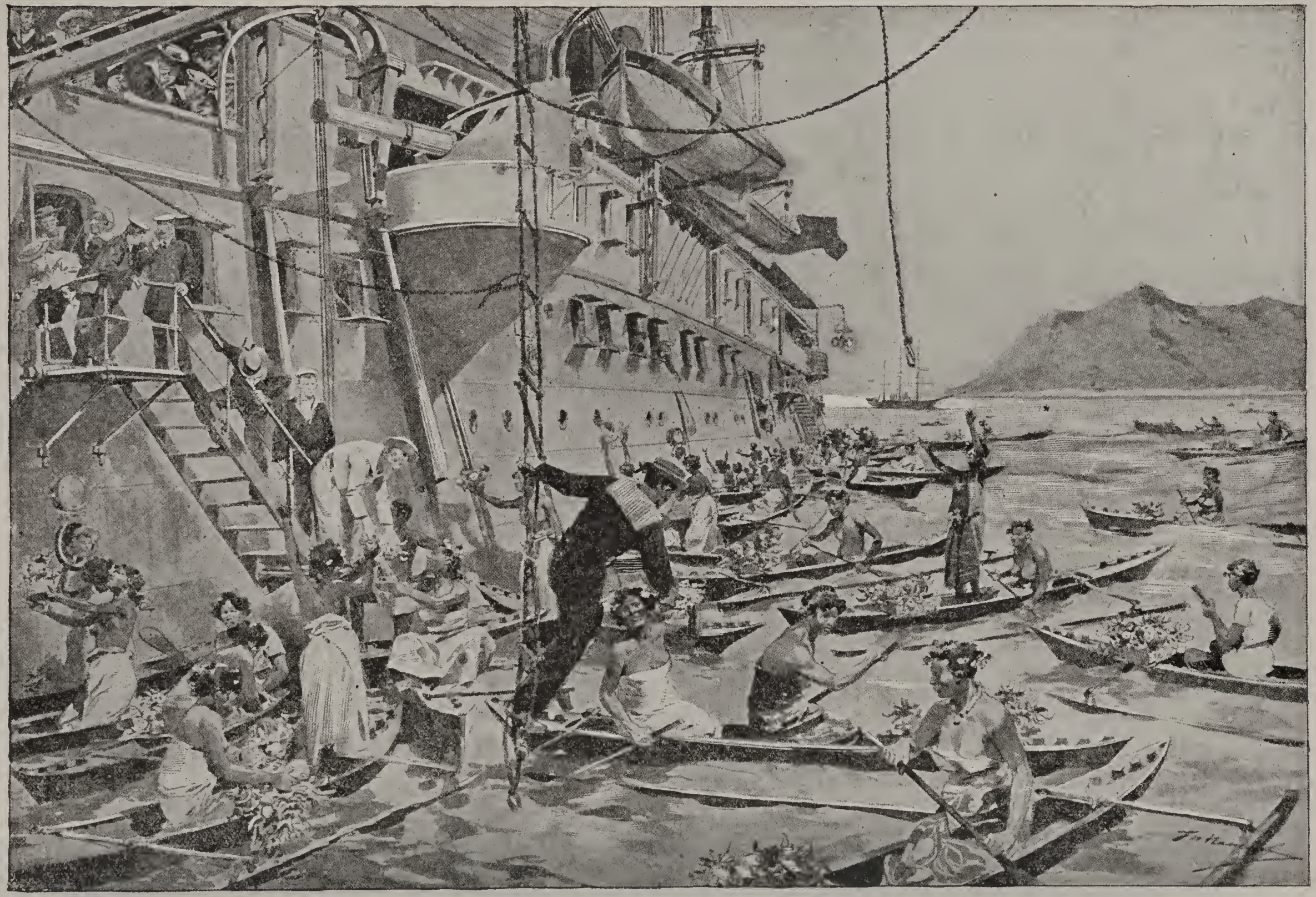
The police of all the large cities located on streams have a dredging system for recovering the bodies of people lost in the water. The most common term used for these dredges is "grapples." These grapples are strong iron hooks, weighted, and which are attached to long ropes. When thrown out of a boat they sink to the bottom of the stream. They are then drawn along in the expectation that their hooked ends will catch in the body of the lost person or the clothes, thus enabling it to be brought up. Despite the care with which the police dredge, most of the bodies lost in water are never recovered.

Gold dredging is a process used in the mining countries where the gold is not in quartz but in placer form, upon or near the surface of the ground, and loose. An iron bucket or dredge is run into this by hand or steam power, and the loose material taken up and deposited in running water. This water is so arranged that it separates the gold from the earth, carrying the earth away and depositing the gold in pans. Diamond dredging is of the same character, the water carrying off the blue earth in which the diamonds are found, and leaving the precious stones in sight.

Deep sea dredging is usually undertaken for the purpose of bringing up for naturalists the flora on the bottom of the ocean. This dredging is accomplished with great grapples, which are let down into the ocean to the depth of one or two miles, and when they come up the clinging seaweed and strange growths of the ocean bed are attached. By this method naturalists have mastered many of the secrets of the ocean.



BASALTIC ROCK FORMATION CAUSED BY WATER EROSION,
Marked examples found in the United States and Ireland.



BATTLESHIPS IN SAMOAN WATERS—NATIVE MERCHANTS TRADING FRUIT AND VEGETABLES

PETRIFIED FORESTS OF ARIZONA.

The most Remarkable in the World—Originally Composed of Firs—May Become a National Park.

THE most remarkable petrified forest in the world has been discovered in the northwestern part of Apache County, Arizona. According to geologists, the specimens found in this forest are the most wonderful of their kind in existence. Originally the forest was composed principally of fir trees. It is eight miles square and is located on a plateau 5,500 feet above tide water, but the theory has been advanced that in its original state the woodland existed at a much higher altitude. The surroundings of the forest are especially desolate, nothing growing in that region save brush and soapweed.

THE GIANT'S CAUSEWAY.

North coast of Ireland. Natural rock formation created by water and fire. Ancient legends said that fabled giants used it for a path.

The greater part of the trees are completely petrified as far as the wood is con

cerned. They have an outer coating of sand and gravel which it is believed was formed by the action of the elements and by the movements of the trees at different periods in the world's history. The forest is extremely picturesque, but much of the scenic effect is destroyed by the barrenness of its surroundings. Geologists have advanced many theories for the petrification of the trees. One scientist claim that ages ago a volcano shower buried a number of forests in the southwest, and that the action of the water in later periods produced the necessary chemical action to change the woody matter into its present form. There is, however, little evidence of volcanic action in the region adjacent to the Arizona forest. Congress has been petitioned to set aside the land as a national park.

A WIRE THAT TALKS.

Mechanical Devices Used—Comparison with the Telephone—Method of Magnetizing the Wire—A Novel Invention.

THINK of a phonograph without a cylinder or diaphragm, a phonograph that simply strings its records on a piano wire, as you might file so many written sheets of paper. That is what a New Orleans electrician has invented. Its description is not difficult. When you talk over a telephone the vibrations of your voice send out a series of delicate electric waves. In the new machine a telephone is connected with an electro-magnet, which is excited by the little waves as they travel through it in infinitely rapid succession, and at the same time a long piece of piano wire is drawn past its two poles, very near, but not touching. This magnetizes the wire, but as the magnet itself is continually varying in power, owing to the vibrations, there is a corresponding variation in the effect it produces. That is, the wire is magnetized in different degrees all along its length, as if it were divided into millions of very thin disks, each of a separate magnetic power. These disks are your record.

For reproduction a mild electric current is sent through the magnet, and the same wire is again passed in front of the poles. The irregularly magnetized wire breaks the current into exactly the same kind of waves that were originally sent out from the telephone, and when an ordinary receiver is connected with it you hear a reproduction of the voice just as it is heard over the telephone.

BRIDGE OVER THE FIRTH OF FORTH, SCOTLAND

THIS BRIDGE IS CONSTRUCTED ON THE PRINCIPLE OF THE CANTILEVER BRIDGE AND CONSISTS OF TWO MAIN SPANS OF 1700 FEET. THE TOTAL LENGTH EACH OF THE VIADUCT, INCLUDING PIERS, IS 8296 FEET. IT IS ONE OF THE GREATEST TRIUMPHS OF ENGINEERING SKILL IN MODERN TIMES

Teaching a Child to Speak.

Periods of Development—What Sounds Express—The Child Learning Words and their Meanings—Use of Imitative Words.

PROFESSOR WUNDT, the German psychologist, has published his theory of the development of speech in children. In this development he distinguishes three periods. The first extends over the first five or six weeks of the infant's life, during which it utters only inarticulate vowel sounds or cries. In the beginning these cries always indicate cold, hunger, or sharp pain, but before the end of the first week they are called forth also by slighter causes, such as an uncomfortable position.

In another month the child begins to cry from impatience and weariness, and the first utterance of cries of pleasure dates from the same time. Gradually the cries become more varied and semi-articulate sounds like "ar," "ro," and "ka" are heard. Such sounds form a transition to the second stage of development, that of articulate sounds, which rapidly increase in number and variety. Combinations like "am," "ab," "na," and bu" are used to express a feeling of passive comfort and enjoyment of life.

Keener pleasure finds utterance in a loud crowing sound, which differs from the cry of pain by its higher pitch and shorter duration. There is little further change during the first year. New combinations are added, but they have not the character of words of definite meaning, but are simply expressions of states of feeling like the simple cries that preceded them. The same remark applies to the repeated syllables "ba ba," etc., which usually are developed in the latter half of the first year. These are usually expressive of perfect physical comfort, which seems to produce a sensation of rhythm. About the end of the first year the child usually begins to imitate sounds that it hears, and especially words.

Tendency to Echo.

This tendency to echo sounds varies greatly in different children. At first the sounds are simply repeated without any meaning being attached to them. But the child gradually learns the meaning of words, and soon begins to use them of its own accord to designate objects.

Then it has entered on the third stage, and has become a real student of lan guage. It calls its parents "mamma" and "papa," and has names for all the persons and things of its daily environment. From this point progress is usually very rapid. A girl who first uttered a word, with an understanding of its meaning, in her twelfth month, had acquired sixty-six words in the nineteenth and seventy-eight in the twentieth month.

The speech of a child up to the third year, or later, is full of almost unrecog-

nizable corruptions and of reduplications which correspond with the stage of development of its ideas and form a sort of universal language, for they differ little in different countries. But the use of imitative words like "bow-wow" for a dog varies greatly. Here are a few Japanese words of this sort that are readily intelligible:

"Wan-wan" (dog), "nva-nva" (cat), "ko-ke-kio" (nightingale), "sion-sion" (sparrow), "bun-bun" (bee), "gou-gou" (a large bell), "goro-goro" (thunder), and" fu-fu" (fire).

I'll soon show him something
Here he is, coming to see me
HOW I SERVED THE DOCTOR
See my tongue? Why not?
He says he can't see it.
Can you see that?
He thinks I will take his old medicine

SUGGESTIONS FOR TEACHING CHILDREN FACIAL EXPRESSIONS.

ELEVATED ROAD SPEED.

Hopes They May Run Two Hundred Miles an Hour Yet—Description of the Beecher System—High Record of Steam—A Train of One Coach.

THE possibility of running elevated trains at the rate of one hundred and even two hundred miles an hour for long distances is said to be near. Millions of dollars have been spent by inventors in trying to find the secret of the "single rail" in railroading. The three systems which have attracted the most attention, and which are said to possess the greatest merits, are the Brott, the Beecher and the Boynton.

The Beecher system has been before the public more or less prominently since 1898, and it is believed by many practical men of this enlightened age that before many years it will be no uncommon thing to leave New York after lunch and reach Chicago—one thousand miles away—in time for dinner. The demands for time-lessening railway runs are increasing every year.

When the distance between New York and San Francisco can be covered in five hours the man living at the end of the nineteenth century will perhaps be content. It takes four days to cover the four thousand miles at the present writing—

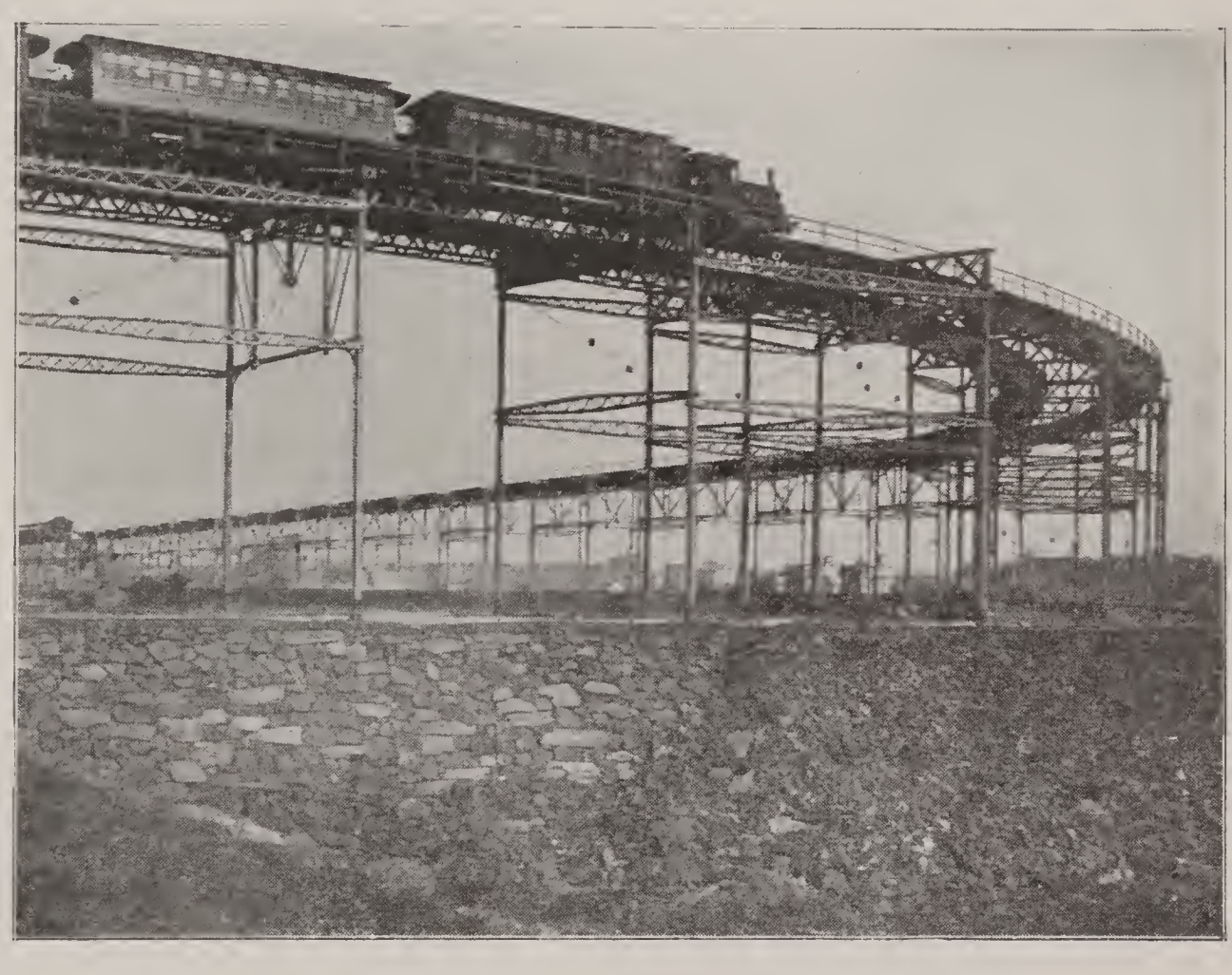
NEW YORK OR MANHATTAN ELEVATED ROAD AS IT APPROACHES THE BATTERY, NEW YORK HARBOR.

Steam's High Record.

A steam locomotive has made a record, over a short distance, of nearly 125 miles an hour, but such a speed, even if it could be maintained for a great length of time, would be dangerous on a surface road. That is why

the elevated structure for trains which are to travel at tremendous rates of speed must be put on, where the danger arising through striking objects and running off the track can be done away with. It is asserted by inventor Beecher that it is an impossibility for his cars to run off the track, no matter what the speed attained.

In 1888, E. Moody Boynton, a resident of Massachusetts, built an elevated road at Coney Island to exhibit the merits of the "bicycle" in railroading. As this experiment had not the advantage of electricity as a motive power, because at that time electricity was not used so extensively, no astonishing speed was shown. But the exhibit attracted a vast amount of attention. Through the contrivance of an overhead guard rail the inventor claimed that it was impossible for the cars to leave the track.



THE GREAT CURVE OF THE NEW YORK ELEVATED RAILROAD.

At its highest point, 116th Street and 8th Avenue. A steel structure upholds the track.

Improving the Plans.

So impressed were other engineers that many began to work on the ideas given by Boynton. George S. Brott, of Washington, D. C., and Captain Lina Beecher, of New York city were the most successful. A sort of steel trench, with guide rails half way up the side, was the first method adopted by Brott to prevent his cars from being derailed. This, however, did not prove satisfactory, and about 1891 the arrangement was changed so that the guide wheels were placed near the base of the cars, though being still on the side and operating on lateral tracks. This is still retained by the Brott system. While the three inventors were all working in the same groove, so to speak, the "monorail" system of Beecher's has withstood the severest test, and for that reason is to-day — in 1900 — considered the most feasible for utilization.

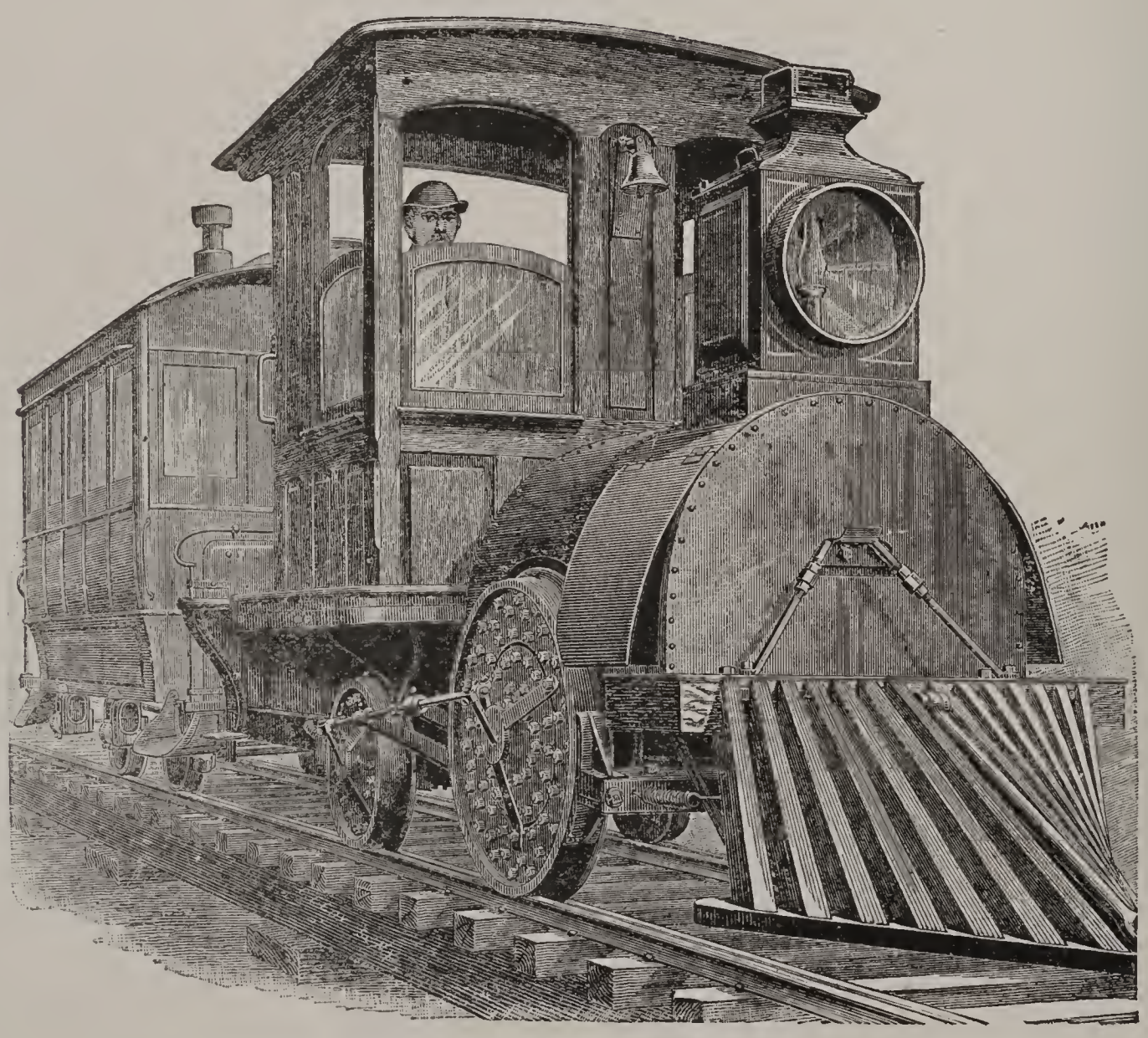
With the main idea one of making it impossible for the cars to leave the track, Beecher worked out his problem. The question of air resistance has been met and successfully overcome as well as the use of electricity as a motive power. Instead of using a car as wide as that of the model of Brott's, Beecher reduced the width to four feet. The cars, or coaches, as they are called by railway men, are built of aluminum and lined throughout with asbestos, which makes everything about the coaches absolutely fireproof.

It is claimed that the cars can be stopped, when running at full speed, within a distance of four hundred feet. Electricity is used as a means of providing heat, and though the coaches are narrow, no lack of comfort is apparent.

Train of One Coach.

Instead of there being a train consisting of several coaches, the Beecher train has but one coach. It has a carrying capacity of fifty and is pointed at the front end so that it looks much like a long bullet. The car contains twelve sections of four seats each, and has also an observation section, of two seats, at the rear end. Entrance to these sections is from the side and every passenger is furnished with a window from which to look out at the scenery.

With motor and all equipment the Beecher car weighs about ten tons, which is about two hundred and fifty pounds to the passenger. One of the finest equipped and fastest express trains in the world, the Empire State, engine and four coaches, weighs four hundred and forty tons, or about two tons to the passenger. It is needless to say that the saving in motive power is vastly in favor of the Beecher system. Beecher claims that the air pressure is greatly reduced through operating but one car at a time. The claim has been made, and subsequent events have proved, that it is impossible to derail the Beecher cars, even when they are turned upside down.



THE MAGNETIC ENGINE

THE "BUCKET SHOP."

How Commodities are Sold Without Any Article of Value Being Put Up—Gambling Without An Actual Purchase—The Victim Has no Recourse and Must Suffer—Cutting the Wool from Lambs.

"BUCKET shopping" differs from legitimate board of trade trading. The legitimate broker makes his profits through the commission paid by his customers, but the operator of a bucket shop can make money only when his patrons or victims lose. Although it is commonly accepted as a fact that trading on a board of trade is nothing short of gambling, respectable people engage in it and are frequently prominent members of the communities in which they reside. People who do business with a "bucket shop" are plain gamblers in the best sense.

It is true that many of the people who are seen in "bucket shops" are men and women much above the average gambler, but they all know that they are speculating on the rise or fall of the price of a given commodity and that the money they deposit as a margin is not used as are margins in the hands of stock and grain brokers. A broker receiving money from his customer actually buys an option on a certain amount of stock, cotton or grain. While for the most part a broker is never expected to buy outright or for "delivery" the entire amount of any commodity or stock upon which he may have an option for his customer he can do so if his customer desires.

THE FRONT VIEW OF THE BOURSE OR MONEY MARKET OF BRUSSELS, BELGIUM, ONE OF THE MONEY CENTERS OF EUROPE.

No Actual Purchases.

With the "bucket shopper" it is just the reverse. He has no intention of purchasing an option in anything, nor does his patron expect it. There is never any actual purchase. The "shop" does not

buy the goods or stock and could not deliver them if the customer demanded it. The Wall Street axiom that the public is always wrong in guessing is the foundation for the existence of all bucket shops. When the gambling public does guess right, as is sometimes the case, the "bucket shop" is apt to close its doors, and those who have actually won on the change in prices are deprived of winnings that in most gambling dens would be promptly paid.

There is no meaner form of gambling than the "bucket shop." The men who engage in it are usually unscrupulous to a degree, and will hesitate at nothing to gain a few dollars to swell their ill-gotten gains. Because the outward form of the bucket shop has an appearance of certain respectability, the influence is worse than other kinds of gambling, which can be suppressed when the limit of tolerance is passed.

Average of Bets.

Bets ranging from one to ten dollars are the average in most "bucket shops." It is no uncommon sight to see messenger boys and young men who receive but a limited salary, wagering their little sums on the fortunes of a turn in the market. Usually there is no chance to cash their winnings, but when a lucky stroke goes their way it is the exception if the operators pay what is due their clients.

Cases are not rare where "bucket shops," in the face of a rising market—that is a market where the prices of most of the commodities are advancing—have urged their customers to buy, with the firm intention of "suspending" when demands for settlement are made. Again there are establishments which do a tremendous business, if it can be so called, and have a capital sufficient to tide them over any temporary embarrassments. Operators of "bucket shops" devise every means possible to get the money of those who become victims. Some concerns of this character make $500,000 a year.

The bogus broker and banker is another evil whose power for doing harm is great. Under the guise of conducting a legitimate business every effort is made to bring under the spell people who are innocent of the "sharper's" ways. Although the New York Stock Exchange and the Chicago Board of Trade have spent thousands of dollars in trying to break up the business of these concerns, they have met with little success.

Swindling Ways.

Solicitors and newspaper advertisements are used to coax the unknowing. Why people who are rational will believe that the "inside information" said to be possessed by the "brokers" can be bought for a mere song when the promised profits are taken into consideration is a source of constant wonderment to those who are called on to help the unfortunates out of the dilemmas that they continually get into through their foolish actions.

One of the most harmful outgrowths of the "bucket shop" is the "Discretionary" pool fraud. This is the baldest swindle ever perpetrated on the public. The alleged operator makes the acquaintance of a victim and is given money to be placed in stocks or grain or some other commodity that "promises best." Of course he reports to the victim that he invested in something that has gone the wrong way of the market and there is nothing left for the investor to do but smile feebly. The peculiar part of it is that the man who has lost the money seems to believe that the operator did the best he could.

RULES FOR A YOUNG MAN'S SUCCESS.

Good Character Necessary—Mental Training Essential—Effects of Dissipation—Caution Against Overwork—Physical Exercise Recommended.

IT has been said that success is mental, moral and spiritual. Most writers who have discussed this vital topic have raised it above a mere sordid interpretation, above the material into the realm of spirit and intellect. One writer says that every truly successful life must necessarily be self-sustaining, and in fact ought to have something more than only the means of livelihood; while, on the other hand, another maintains that success may exist amid the environments of indigence.

If we accept the first definition with the financial clause, we shall certainly come nearer the opinion of the majority of people, since we are living in an age when money-getting is rampant, and therefore it would be inappropriate to omit the consideration of finances. This same authority places character above all other requisites. He says:

"Bodily vigor is good, and vigor of intellect is even better, but far above both is character. It is true, of course, that a genius may in certain lines do more than a brave and manly fellow who is not a genius; and so in sports vast physical strength may overcome weakness, even if the puny body have in it the heart of a lion. But in the long run, in the great battle of life, no brilliancy of intellect, no perfection of bodily development will count where weighed in the balance against that assemblage of virtues, active and passive, which we group together under the name of character."

Kinds of Character.

Perhaps this observation would have been truer if the author had said "good character," for character may be either good or evil, since it is only another name for the personality of men—and men are both good and evil. Shylock had plenty of character. It obtruded, so positive was it; but it was the wrong sort. It was evil. Considering the matter of material success, opportunity and possibility deeply absorb the attention of the ambitious young man, and for him one writer has these encouraging words:

"The average young man into whom the average boy develops is, of course, not going to be a marvel in any line, but if he only chooses to try he can be very good in any line, and the chances of his doing good work are immensely increased if he has trained his mind."

In this age there is no excuse for ignorance. We are so abundantly supplied with means of education—within the reach of all—that it is the question nowadays, "What shall I not study?" not, "What shall I study?" Your successful elder will tell you to be patient and industrious, and to work hard, but that unaccompanied by intelligence—the trained

mind—will not bring success; although all those are very necessary.

A mule is patient, industrious and hard-working, and he has been properly named an "ass." Given the opportunity, then, to be "very good in any line," the first and continual step of the young man—for

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HON. D. B. HENDERSON.
Speaker of the House of Representatives.

successful men are always learning—should be the training of his intellect. If a college or university education be beyond his reach, he may follow in the footsteps of Lincoln, who learned more by himself than any school could have taught him. The chief value of our schools is that they establish mental discipline and studious habits, rather than that they deal directly with the practical affairs of life; although their present tendency is in that direction, as our manual training, domestic science and business schools attest

The next logical step is the choice of a profession, and there many mistakes are made, for the young man usually examines the field with regard to its value alone, and not with regard to its value to him. "Is it a good business?" is the question, not, "Is it a good business for me?" No man can succeed in a work which is distasteful to him.

Qualities Necessary.

Having intelligence and the choice of a profession assured, it is thoroughly agreed among successful men that reliability is the next consideration, and next in importance is resolution and perseverance.

"Perhaps there is no more important component of character than steadfast resolution," writes one.

And another:

"The unreliable man is a public nuisance."

And again:

"One must be systematic, assiduous and painstaking in the prosecution of his enterprises, and must cultivate the good opinion of his fellows."

And:

"Chief among the causes which bring positive failures is vacillation."

A noted pugilist once put a philosophy into these words:

"Any man who can't take a punch had better not get inside the ropes."

It is the ability to take the "punches" of experience and get on his feet a little wiser, that grim determination to surmount insuperable difficulties which characterized Grant when he said: "I'll fight it out on this line if it takes all summer," the "staying power": these are the emblems of that irresistible force we call determination.

Most young men have an idea that it is permissible to "sow wild oats." Such a fallacy should be instantly dismissed. Dissipation has three serious effects in a young man's life. Naturally the most important of these is the attitude of the prospective employer toward it. An applicant who shows signs of indulging in liquor or other vices has no chance against him who is morally clean. The cigarette has been black-mailed by many large firms.

THE BEST EXAMPLE OF INDUSTRY.

An apiary or bee farm in California where honey is produced by scientific cultivation of bees.

Further, the effect of dissipation upon the physical and mental power is disastrous. Who has not read in the lack-luster eye of the dissolute the feeble mind and inert body. The third is what has been called the "spiritual" effect, and there can be no doubt that the spiritual nature is deadened by neglect.

Evils of Overwork.

A serious error among the youth of to-day may exist in overwork. A successful financier once wrote: "Overwork is worse than no work," and he was right. The ambitious young man should take the measure of his capacity for work carefully, and never overtax it. Another sees a national danger line. He says:

"For the only danger before capable young Americans, and, indeed, before our nation, is that of hurrying too much, of sweeping on too rapidly, of straining every nerve too tensely, of living our lives too strenuously. What most young men of this country need is restraint, not stimulant. What this nation needs is reserve. The only serious fear I entertain is that the rapidity of our lives will make us neurotic and decadent."

Here should be emphasized the value of physical exercise. Young men do not seem to realize that brain power relies upon physical strength. It is the foundation of all activity. True, some great men like Byron were weak physically, but

bright minds over weak bodies usually result in early death, as was the case with Byron.

George Washington was the best wrestler in northern Virginia, and Lincoln, in spite of his spare build, was a powerful man. It is the physical reserve that carries great men through crises. So every young man should be as careful in training his body as he is in his mental and moral attributes. To sum up, then, any set of rules for the guidance of young men aiming for success ought to include:

Mental training,
Honesty,
Reliability,
Perseverance,
Morality,
Caution against overwork,
Physical culture.

This will, if properly followed, insure a symmetrical development mentally, morally and physically. And in addition to this the spiritual life must not be neglected. Church work of any sort is a source of power, and is very pleasurable. In conclusion, these words of a prominent public man will be appro priate:

"There is just one lesson these ancient ruins (of Nippur) teach, and that is the nothingness of fame, and that the only real things in life are love and duty. I cannot think of any blessing so great to an ardent young American as to learn on the very threshold of his career of activities that duty and affection are the only things really worth his while—the only things that pay increasing dividends and never become bankrupt."

The Most Expensive City in the World.

New York's Annual Expenses Compared with those of Other Cities—Sources of Revenue—The Sinking Fund, Annual Receipts.

THE annual expenditures of the city of New York are greater than those of any other city in the world. The gross budget of the city for 1899 was $20,000,000 greater than the expenses of London, $18,000,000 in excess of the budget of Paris, and only $1,000,000 less than the combined expenditures of Boston, Chicago and Philadelphia. The expenses of the city for 1899, for local purposes only, amounted to $19.56 per capita of an estimated population of 3,500,000.

On January 1, 1900, the gross accepted debt of New York City was $358,104,307.11, against which there was a sinking fund of $105,435,871.70, leaving a net funded debt of $252,668,435.41. The city of Paris, with smaller available resources than New York City, has a debt in excess of $500,000,000. The gross expenditures of the city during 1899, not including permanent improvements, paid from the proceeds of bonds were $93,520,082.03.

The total receipts of the city for the same period, from all sources and for all purposes, according to Bird S. Coler, the city comptroller, were approximately $108,000,000. The income was derived from three general sources, taxation yielding $84,000,000. The budget, which represents the money to be raised by taxation, was reduced $9,000,000 by income

known as the general fund. The chief items of this were:

Excise taxes	$3,600,000.00
School money from the state	1,280,883.45
Fees of various county and city offices	246,576.65
Interest on taxes and assessments	979,185.35
Unexpended appropriations	1,356,786.57

The gradual reduction of the city debt, except as it is maintained or increased by additional bond issues, is provided for by an increasing and protected sinking fund. In 1899 the total receipts of this fund were $15,601,492.50. The Croton water rents, which amounted to $4,590,502.55 in 1899, are applied to this fund, as well as the dock and slip rents of $2,362,421.14.

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HON. SETH LOW
Mayor of Greater New York

Among the other chief items of this fund are:

Revenue from investments	$3,573,519.34
Ferry rents	370,776.00
Market rents	251,500.00
Interest on deposits	520,526.00
Installments included in the budget	2,633,110.00

More than $1,000,000 is derived annually from miscellaneous sources.

The budget of the city for 1900 is $90,778,972.48. It will be interesting to compare these figures with the expenditures of other cities. The approximate current expenses of London in 1899 were $73,000,000; of Paris, $75,000,000; of Berlin, $23,347,600; of Boston, $35,454,588: of Chicago, $32,034,008; of Philadelphia, $27,075,014. This comparison shows that New York City is the most expensive city in the world.

NAVY YARDS OF AMERICA.

Birthplace of America's Great Battleships—Their Manner of Construction—Origin of the Kearsarge—Where the Oregon Came from—The Illinois Now Under Way.

ON the Long Island side of the East River, between the Brooklyn bridge and the Williamsburg ferries, is located the famous Brooklyn Navy Yard, the home of the North Atlantic fleet. The place first became famous during the revolutionary days when the British prison ship Jersey was anchored in the harbor with its thousands of American prisoners.

The first sight presented to a visitor in the yards is a park of guns. Here are Mexican mortars, Confederate howitzers and other trophies that mark the prowess of sailors. The offices and storehouse, like a little town in themselves, present the next busy scene. Then comes a host of boiler shops, machine shops, blacksmith shops, foundries and many other buildings in which the myriad parts of the floating forts are manufactured. Occasionally Uncle Sam builds his warships entirely, as in the case of the ill-fated Maine and the Texas.

These yards excel in dry docks, repair shops, coaling stations and in facilities for overhauling vessels. Every conceivable ship from a monster of 10,000 tons to the minute torpedo boat, although the latter type is not a feature in the construction of the new navy, may be seen there.

On the Pacific coast the great navy yard is at Mare Island, where the coast defense vessel, the Monterey, was outfitted. Mare Island is a short distance from the city of San Francisco, and is finely equipped for the needs of our navy. Another ship-

A GIANT WALKING CRANE HAULING GUN BARRELS.

At the Washington Navy Yard. This Crane travels on an elevated track.

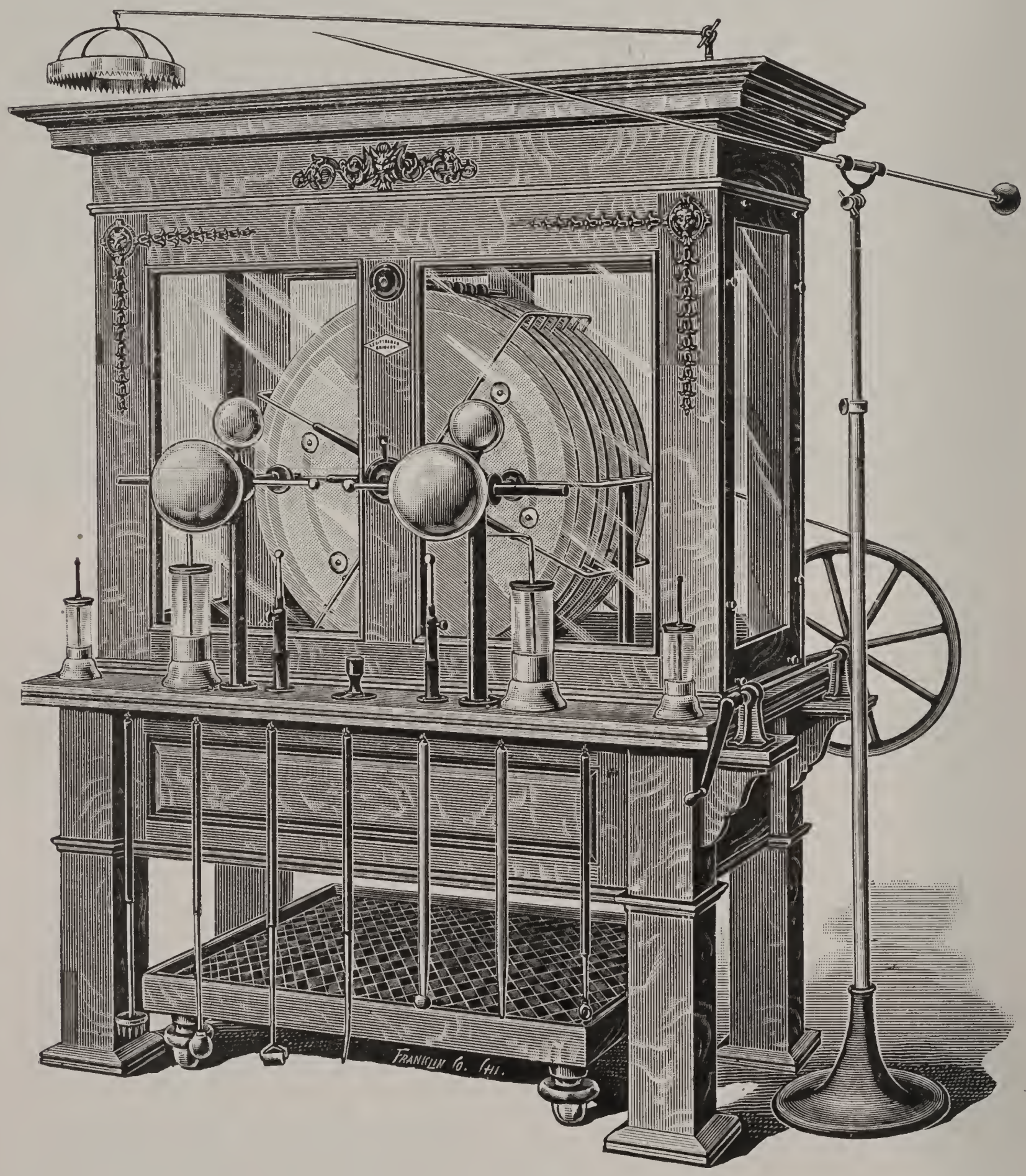
building yards is at Newport News, Virginia. The Kearsarge, the Kentucky and the Illinois were built here. Uncle Sam is not as well equipped with large naval establishments as he needs to be, but there is an indication that Congress intends to remedy this defect at an early date.

STATIC ELECTRIC MACHINE.

Transmitting Electricity to the Human Body—Form of Electricity—Its Effects—A Harmless Stimulant.

THIS is a static electricity machine invented and constructed for the purpose of transferring frictional electricity to the human body without harm. In the illustration the machine is shown as operated by a hand wheel, but they are also run by small electric batteries. When the machine is in full operation frictional electricity is developed and passed to the human body in the form of vibrations instead of a direct shock. The mode of transmission is either through the cap in the illustration, which looks like the spray of a bath tub, and which is suspended over the head, or by means of handles which the patient grasps. The effect of the static electricity passing through the

body is to stimulate the circulation, restore the nervous energy and increase the amount of reserve strength. It is a healthful and pleasant treatment for persons with weak nerves and torpid livers. So far as its effect on the system is concerned, it is harmless.



A STATIC ELECTRIC MACHINE.

The purpose of this machine is the transmission of vibratory, frictional electricity to the human body, without a direct shock. Transmission is made by means of the crown suspended over the head, the pointed rod, or by handles.

CRIMINAL AND CIVIL LAW.

What Criminal Law Provides—Dueling a Crime—Division of Law—When Martial Law is in Effect.

IGNORANCE of the law is no excuse.

You cannot lawfully condone an offense by receiving back stolen property.

The police are not authorized to make arrests without warrants unless they personally know of the offense for which they may be made.

The adage that "Every man's house is his castle" does not apply when the man is accused of crime and a warrant is sworn out against him.

Embezzlement can be charged only against an officer, agent, clerk or servant of a corporation.

Petit larceny is when the property involved is less than $25; grand larceny when over that amount.

The crime of arson must have been committed at night and when the buildings were inhabited.

Drunkenness is not a legal excuse for crime, but when it has gone to the extent of delirium tremens it is often held as insanity.

A female is not exempt from arrest except in civil cases; criminal matters make her liable.

When a sheriff appeals for assistance every man is in law bound to obey the call.

Criminal Carelessness.

Criminal carelessness is a crime, but accident is not. If, through carelessness an elevator falls and kills passengers, the owner and operator may be liable criminally. But if a man is shooting at a burglar and accidentally kills a member of his own family it is not a crime.

Murder to be in the first degree is—must be premeditated, malicious, willful and committed while the murderer is engaged in a felonous act. Dueling is a misdemeanor, as is a challenge to such combat; and killing in duel is murder.

False swearing to be perjury must be willfully done. If a man says that "he believes such to be the case," or that "to the best of his ability such is the case," it is not perjury if the facts are falsely stated. A false statement must be absolute. Subornation of perjury is a felony.

A felony is a high crime; the highest of the principal classes into which crimes are divided by statute; a grave crime exceeding the grade of a misdemeanor.

Forgery is a copying or signing the name of another to any document, with intent to deceive or defraud.

An "offer or attempt at assault" is all that need be proved to show a case of assault. Battery presumes bodily violence.

Bigamy cannot be proved at law when one of the parties to the marriage has been absent and not heard from for five years.

Civil Law.

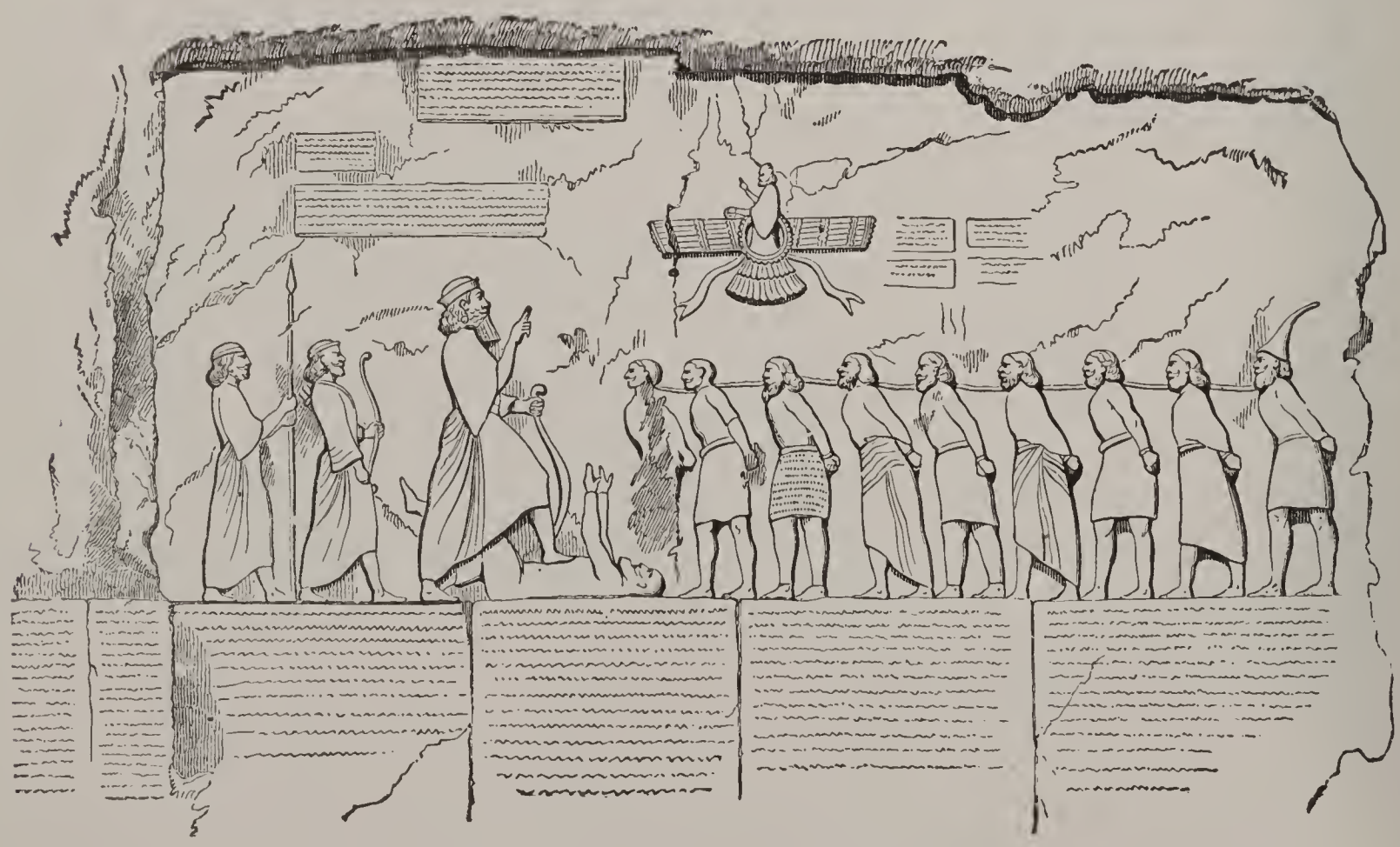
Civil law is a rule of action established by the recognized authority of the state or government to enforce justice and direct duty. All law is divided into the following:

LAW.

Between God and Man		Between Man and Man	
Natural	Revealed	*National* or *Municipal*	
		Constitutional Law	
		Cannon or Ecclesiastical	
		Equity and	*Common Law*
			Public or Criminal
			Private or Civil
		International.	

Civil law is that system of jurisprudence which the people of any State or nation establish for their government as citizens. It particularly relates to all not connected with the criminal. It covers indebtedness, actions on notes and mortgages, actions in trespass, to quiet title to property, to adjust titles, to collect money, to recover damages, to secure divorce and kindred suits.

Commercial law is a branch of the civil law relating to legal proceedings in connection with commercial houses. Maritime law relates to questions pertaining to affairs of the sea. Martial law is in effect when the civil authorities are superseded by the military authorities. Military law is that relating to the army. Municipal laws relate to those of the city. The Roman law is that formerly administered by the government of Rome. The laws of Napoleon are those laid down by the first Napoleon of France. Sumptuary laws are those regulating the traffic in intoxicating liquors.



ANCIENT JEWISH CAPTIVES

TRUSTS AND COMBINATIONS.

Origin of Trusts—Necessity for Combination of Capital—Difference Between Monopoly and Trust—Some Court Rulings.

THE progress of civilization has led to combinations of capital and the centralization of control. The signs of this are no better shown than in the desire of people to seek places of dwelling in large cities. While the tendency of private business houses for many years has been toward combination, not until 1898 did people begin to look at the so-called trust, or combination, as a thing to be shattered and blown to the four winds.

The first element which is the inducement for forming combinations is the limitation of the liability of the parties involved. The second is the perpetuity of the business and the fact that, unlike a partnership, the company does not dissolve upon the death or removal of one or more of its members. Many business houses have been converted into private companies which possess the advantages already mentioned but which do not properly belong to combinations.

A general depression of business and a falling off in the profits of the ordinary business, forced men to look around for means by which expenses could be curtailed. When every method of reducing expenses had been exhausted, it became compulsory to seek additional ways to make both ends meet. After some little experimenting it was discovered that several competing firms, by uniting in the distribution of products and arrangement of price and the adjustment of credit, could raise the profits.

These arrangements were first called "pools." As they were merely verbal agreements, they were often violated in secret for no other reason than because no binding contracts had been drawn among the firms in the understanding. The outcome of this led to the formation of many concerns under one central control, and these were nothing less than combinations.

Origin of Monopolies.

A monopoly, so called and often confused with the terms "trust" and "combination," was originally a grant or license by the crown to a subject for the exclusive privilege of buying or selling, making, working or using anything. In the course of time the term monopoly has come to be used in relation to any natural or economic condition wherein a particular trade, industry or occupation is under the control of a few persons Properly speaking, the term has no place in current discussion of trusts and combinations. It is used because three centuries ago it became so obnoxious to the English-speaking people that it serves to arouse prejudice to call anything objectionable a monopoly.

A trust, as interpreted in the year of 1900 is a combination of corporations formed by the creation of a trust, wherein

stockholders of the several corporations deposit their stock with trustees, receiving in return receipts in the form of trust certificates; the control of the several corporations being vested in the trustees, who thereby formed one central body.

In 1899 when the courts decided, in the North River Sugar Refinery case, that it was illegal for corporations to turn over to a body of trustees the control of their affairs this form of combination has virtually been abandoned. It will be seen, therefore, that as the term "monopoly" is irrelevant when commonly used to express the meaning of a combination, so also is the term "trust." Nevertheless both these terms are used and present indications are that they will be used for some time to come. When any one of the three expressions is used, therefore, in most cases it will be discovered that the combination form is referred to.

COMMODORE VANDERBILT, Wealth, $100,000,000, Father. WM. H. VANDERBILT, Wealth, $200,000,000, Son. CORNELIUS VANDERBILT, Wealth, $100,000,000, Grandson. ALFRED VANDERBILT, Wealth, $150,000,000, Gt. Grandson

THE VANDERBILT MEN.

The four generations since the founding of the family.

Watering Stock.

There are combinations doing good to the community, and there are others which can be called nothing short of "pirates." In the latter case the prime evil is that of watered stock. This came about at first through the necessity of rewarding the promoter, or the man who was responsible for bringing about the formation of the combination. Watered stock is simply the issuing of engraved paper which represents no assets. It has no reserve to back it up, pays practically no dividend, and for this reason is worthless except to be used by speculators for such purposes.

Many combinations have been formed for no other purpose than to be put upon the Wall Street market and made the basis for speculation. So frequently has this class of stocks made its appearance that they have finally come to be called "gambling industrials," and no financier with any shrewdness could be prevailed upon to waste his money in purchasing them.

The combination based on integrity that can be relied on to do what is fair is a blessing. Combination, which rightly interpreted is co-operation, must be the foundation of every honestly conducted trust. Industrial combinations must be conducted on an industrial basis which means several things. First, a fair reward to the wage earner; second, the

production of the best article at the lowest price; third, honest dividends to honorable stockholders, and, fourth, an honest board of directors.

Legality of Combinations.

The test of the legality of a combination is its object. Every combination organized to do anything contrary to law is illegal, regardless of its size or the form of its construction. On the other hand if the object of the combination be within the confines of the law neither size or form will render it illegal.

If a combination is formed for the purpose of controlling prices, production or competition, then it is illegal. The object of all laws and decisions against combinations to control production, prices or competition is to protect the community against the maintenance of prices at levels higher than they would be if competition were unrestricted and production and prices uncontrolled. The main interest of the public is in the price it has to pay for any article, and the popular outcry against monopolies, trusts and combinations is based entirely upon the assumption that they all compel the public to pay higher prices for whatever is controlled. In many States there are laws against combinations of any sort, and for this reason one or two States, such for instance as New Jersey, are made the main places where combinations are organized and incorporated.

There are many combinations of labor, formed for the purpose of advancing the condition of the laboring man. These are all considered legal though some of them really act as restrictions on employers. It is said that some labor leaders who are far-sighted have discovered that it is mainly with large combinations of capital that equally large combinations of labor can deal with certainty of permanent result. In 1890 Congress passed a federal anti-trust act making it a criminal offense for two or more persons to agree to combine in any manner to restrain or monopolize, in part or in whole, interstate commerce.

Each State has the power to prescribe terms and conditions upon which corporations can be created under its own laws, and, what is vastly more important, each State has the power to prescribe the terms and conditions upon which it will permit the corporations of other States to do business within its borders. If the State sees fit the corporation may be excluded from its territory. They may be crudely organized and may frequently abuse their powers, but beyond the prevention of the abuses legislative interference with combinations appears to be diminishing each year. The province of the law is to restrict evil and to conserve the good.

POLITICAL ORGANIZATIONS.

Birth of Tammany Hall—Its Large Field of Labor—A Powerful Organization—Other Organizations and Their Leaders.

NO United States President, or governor or mayor of any city, is elected to office without the aid of a party organization. The head of the organization may not hold an office paying a salary. He may never have held office requiring the payment of a salary from public funds, but this does not affect his power.

Republicans and Democrats alike, in the United States, have organizations perfected to the last detail. It may be a national or only a ward organization, but whatever it chances to be it is so arranged that it works without friction, and can, for the most part, be relied on to deliver to the polls a certain number of votes.

Often one man holds the reins over a political organization. When this state of affairs exists it is called a one-man power. It is almost incalculable the amount of influence wielded by certain politicians who live solely to run an organization of this sort.

In America the most perfect organization in politics is Tammany Hall. Some people say that nowhere is there so remarkable an organization of the kind. This organization, which controls absolutely one hundred and ten of the one hundred and eighty thousand Democratic voters of the city of New York, is under the thumb of Richard Croker. What he says is final.

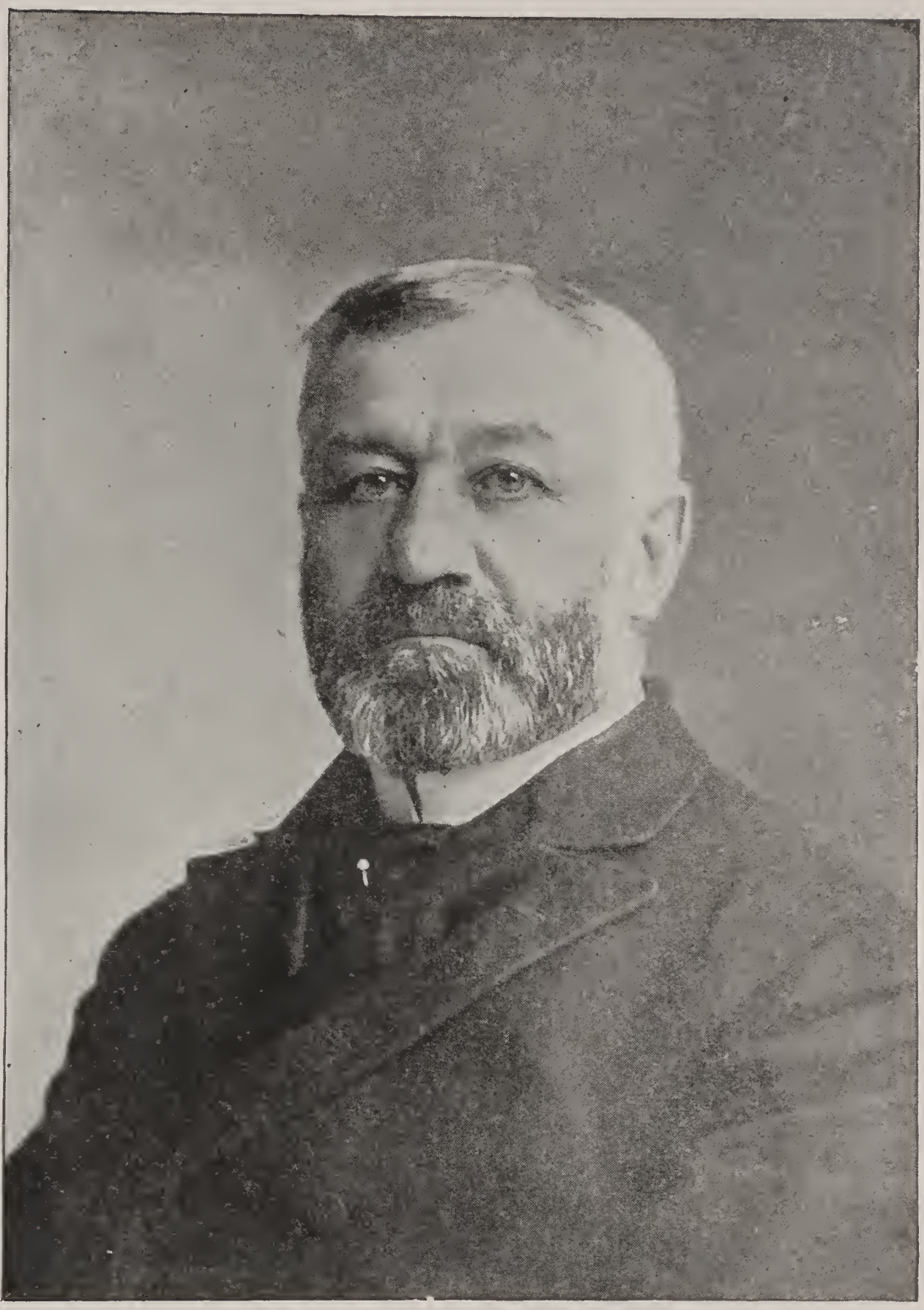
Croker, All-Powerful.

No man or number of men in the organization have ever been able to successfully stand against the will of the most powerful leader Tammany Hall has known. So wonderful is the mechanism of this "tribe," as it is sometimes called, that were it necessary every one of the voters under its control could be reached, without the assistance of a newspaper or any sort of advertisement, within a few hours.

There might be a strong wave of popular sentiment against one or more of the candidates offered by Tammany Hall. There might be a principle involved that would cause the bitter antagonism of the majority of the so-called respectable citizens, but this would produce little effect upon the leader of the "braves" or his followers.

The only post ever held by Richard Croker was that of chairman of the committee on finances. This position he appointed himself to fill, and from its authority he has directed the forces that for years have resulted in the securing of a monopoly on the administration of New York City's affairs.

In 1900 the power of Richard Croker, after having once announced his withdrawal from the leadership, was greater than ever before. John F. Carroll is deputy leader of Tammany Hall. When



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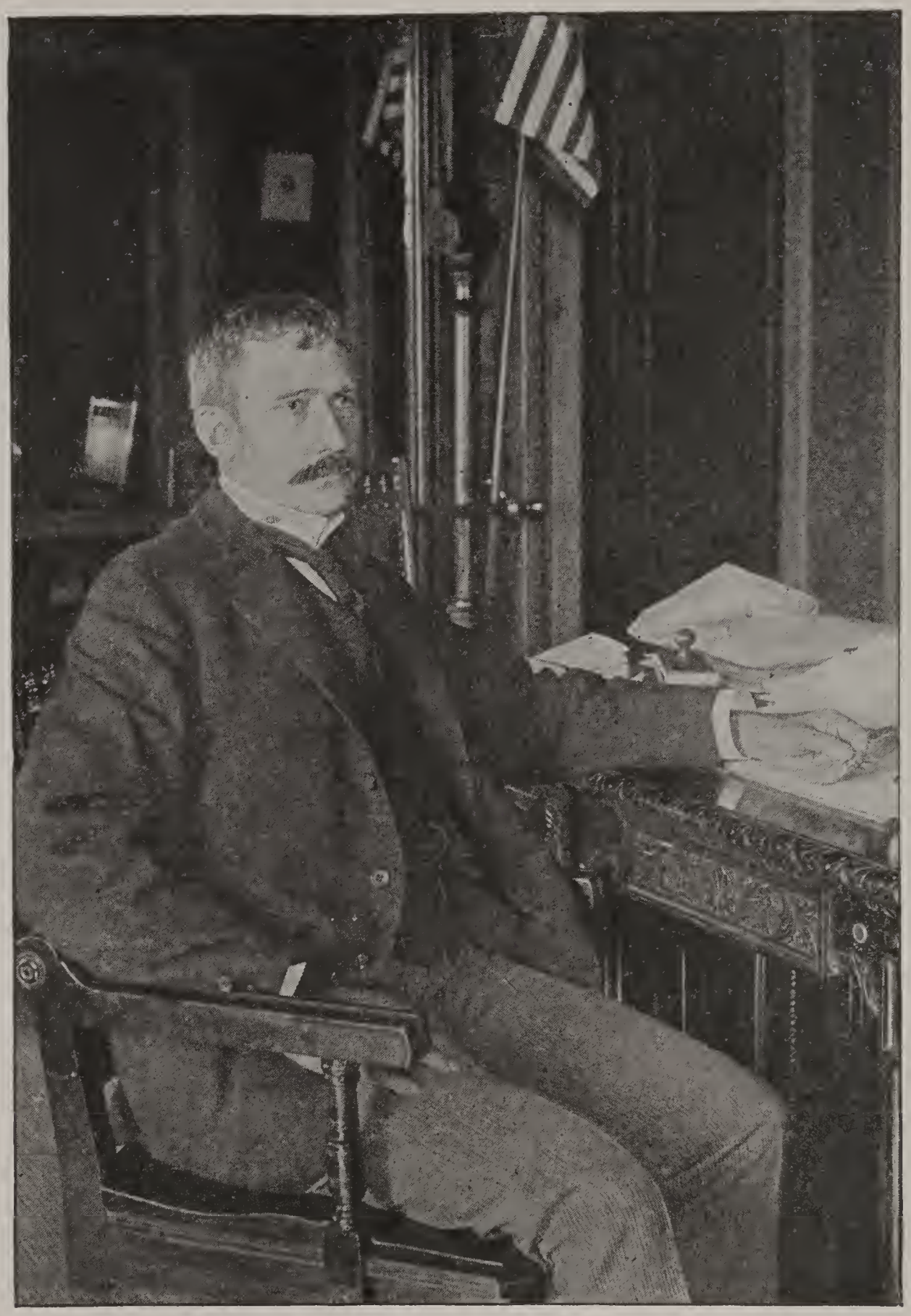
RICHARD CROKER.
Well-known Democratic leader.

the "Boss," as Croker is called, is away Carroll wields the scepter of authority, and no one thinks of opposing his dictations.

Character of Tammany.

The Tammany organization, or the Democratic-Republican organization of the city and county of New York, as it is known officially, is composed of the Tammany general committee, in turn made up of some four thousand members elected from the various districts.

As New York county is divided into thirty-five Assembly districts corresponding to the wards in other cities, there are this number of leaders known as district



ELIHU ROOT.
Secretary of War.

leaders. These men are at the beck and call of the head of the organization.

Each assembly district has a representative of from two to eight hundred members in the general committee, and these members are regularly elected in the primaries. A member of the general committee in each district is elected to a place on the executive committee. The executive committee supposedly runs the machine, but in reality all that it does in the way of official duties is to approve the selections or appointments made by the "Boss," whoever he may be.

The name "Tiger" is sometimes given this powerful organization. It comes from the Tammany Society, and in connection with it there is a tradition that

STEPHEN B. ELKINS.

Chief Tammany once made a speech during which he addressed fifteen Indian tribes, and that the chief gave to each the name of an animal to be taken as a symbol of the tribe. Originally the eagle, the symbol of the first tribe, then in New York State, was taken, but before 1870 the eagle had been replaced by the tiger, the former symbol of Delaware.

Tammany Hall, while doing most of its work among and through the influence of the Democrats, really does not represent a political party, for it is conducted on principles nothing more or less than those of any well-systematized business. The men in the Tammany organization are in politics for what they can get out of it, and they are all willing to admit that fact.

Age of Tammany.

Tammany Hall has been in existence since before 1800. While in 1900 there were signs which indicated that it might

SENATOR HENRY CABOT LODGE OF MASSACHUSETTS.

go down to destruction before many years of the twentieth century had passed, the power displayed in the nominations of 1900 by these "braves" of New York was astounding.

One of the secrets of Tammany's success is that the district leaders are never interfered with in matters relating to the district alone. This unwritten law has caused more than one man, who attempted to violate it, to realize that it was made to stand the test of time. Another reason for Tammany's steady march in the direction of financial reward is the pains taken to provide for all in any way related to the organization who stand in need of assistance.

Twenty-nine of the thirty-five district leaders hold public offices paying salaries ranging from four to eight thousand dol-

ars a year. The other six are merely out of office temporarily, and are amply repaid for any waiting they may have to endure for the benefit of the organization as a whole. There is plenty to do for the Tammany district leader, even though he may not be busy with the duties of public office.

The followers of Tammany must be kept in line and cared for if they require money to tide them over a temporary period of financial distress. This requires the almost incessant working of the district leader and his precinct captains, who are never through with their work. No person on the Tammany "rolls" ever gets out of sight of the organization workers. While the bulk of the work done is among the poorer element, the well-to-do and even some of the wealthy come under the influence of the "Tiger."

The relative of a voter who can control a few votes besides his own can always secure a position through Tammany. The widow who is in need, if her case be worthy, never looks in vain for relief if the precinct captain is within reach. Men who get into trouble resulting in their being arrested are released from confinement on bonds provided by Tammany money. The precinct captain may be called out of bed in the middle of the night to do some favor for one or more of Tammany's dependents, but he does not complain, for here is where his power lays when it is necessary to obtain votes at the proper time.

Losing Power.

The abolition of the "saloon boss" through the introduction in 1895 of the secret ballot and the civil-service reform introduced about that time, have robbed Tammany of much of the power it formerly had. As a result the men in positions paying good salaries, who, as hold-overs, are exempt from taking the examination they surely could not pass, have grown lazy, and many have refused to do the work necessary before and during election times to bring a victory.

Rumors which have been afloat since 1898 to the effect that charges and counter charges have been going back and forth inside the "Wigwam" promise ill for the ultimate career of an organization that will never again be equaled in the history of political events.

All the large cities of the United States have strong Republican and Democratic organizations. The great Republican organization of New York State is controlled by Senator Thomas C. Platt, and is almost as perfect in its working parts as that of Tammany. A great Republican combination is controlled in Chicago by Congressman William Lorimer, while Mayor Carter H. Harrison heads a similar Democratic organization. James G. Blaine, when a candidate for the Presidency, built up what might be termed a "machine," which was almost perfect in its workings. When an effort was made to nominate Gen. U. S. Grant for the Presidency a third time a similar organization worked for him. President Cleveland was never able to perfect such an organization. Nearly all these combinations of politicians are more or less successful as they are able to distribute offices among the men who are their members.

MAKING ARTIFICIAL ICE.

Principle of Machines Used—Method of Freezing and Use of Ammonia—The Ice Crop in the United States.

ICE is now largely manufactured by artificial means. In this day of transporting fresh meats, vegetables and other perishable foods thousands of miles, and when such great industries as that of meat, fruit and others depend largely upon preservation by cold, it was but natural that scientists should cast about for some means of producing refrigeration by artificial process. The expense of cutting ice, together with the uncertainties of the crop because of mild weather, is a source of great dread to merchants; but with a plant equipped for the manufacture of ice little or no trouble is experienced, and the cost is reduced proportionately.

In such industries as great breweries it would be almost impossible to keep the temperature at the required degree without laying in great supplies of ice, and in the great storehouses of the large meat establishments even more inconvenience would be experienced.

Ice-making Machines.

The principal on which ice machines are operated is that of the absorption of heat of the surrounding atmosphere by the circulation of a liquid of exceedingly low temperature—generally ammonia. Sometimes the process by expansion after great contraction is used, as in the process for making liquid air. This method is governed by the principle that when a gas is contracted it becomes warm, but upon being liberated becomes cool again. If, then, air is submitted to a great pressure and while thus confined is cooled by being passed into pipes bathed in cool water upon being liberated it will seek to absorb so much heat from the surrounding atmosphere that ice will be formed in its neighborhood. Liquid air has produced the greatest artificial cold, but as yet it has not taken the place of the ammonia ice-plant.

The principle governing this latter process is that, inasmuch as anhydrous ammonia boils at 32 degrees below zero, Fahrenheit, water when brought in contact with it at 32 degrees F. will at once give up 64 degrees of its heat to the ammonia, and will thus become so cold that it freezes.

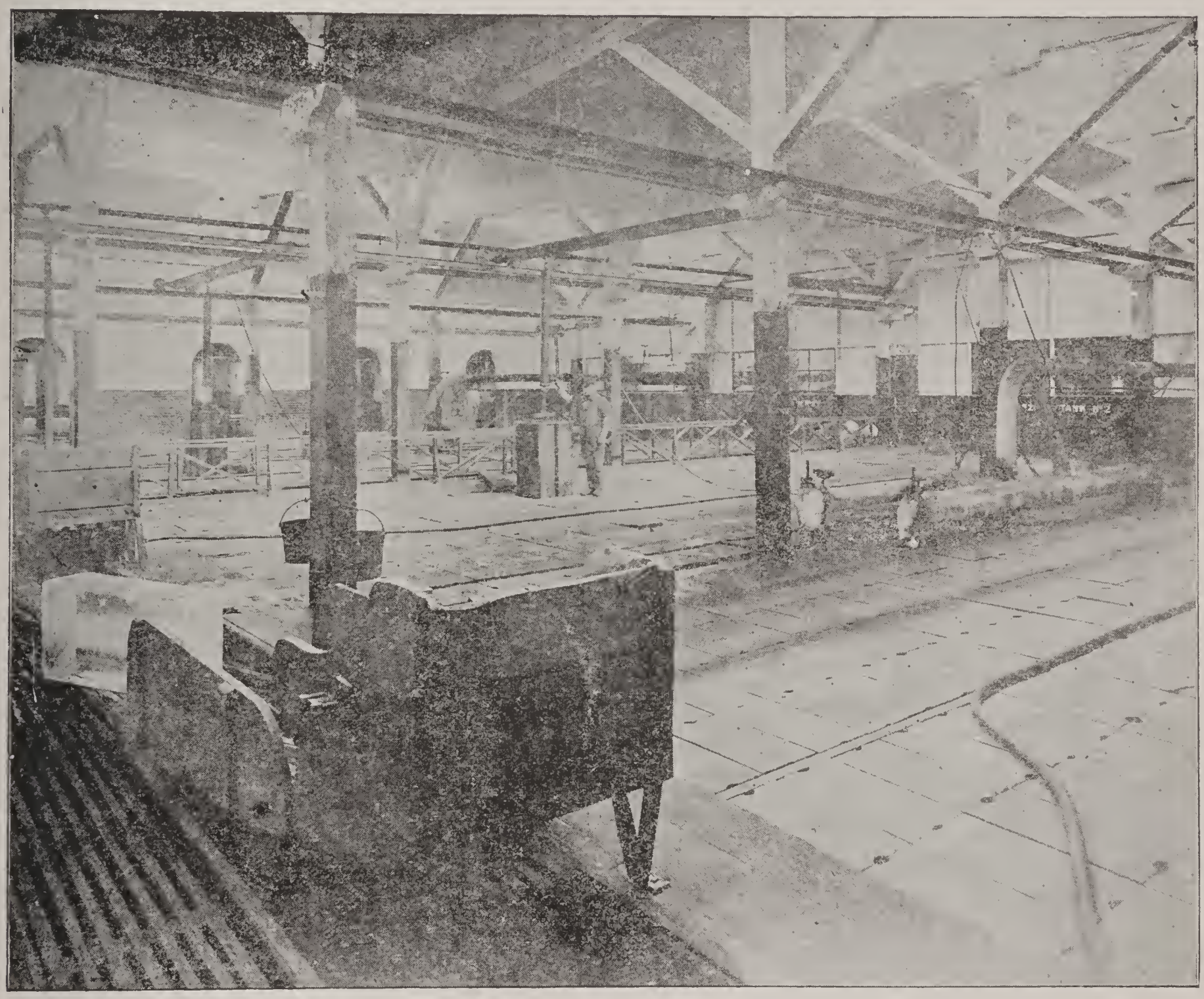
A Freak of Science.

Numerous methods for making use of this freak of science are in operation. One plan, called the "can" system, is to expose water in cans to the ammonia circulating through coils of pipe laid in a tank of salt water. The ammonia absorbs the heat from the salt water, and this in turn freezes the water in the cans by absorbing its heat. This plan is varied sometimes by circulating the ammonia through great pipes in refrigerators and cooling rooms without making the ice, the heat being absorbed at first hand, thus reducing the temperature to a certain

degree of cold. The can process is somewhat antiquated, and while being effective is rather expensive by reason of its bulkiness and the long time it takes to start a plant operating — generally about three days.

same principle of ammonia absorption is used, but everything is more compact, and ice can be produced within a few hours after the plant is started.

The Holden method consists of two parts; the devices for circulating the

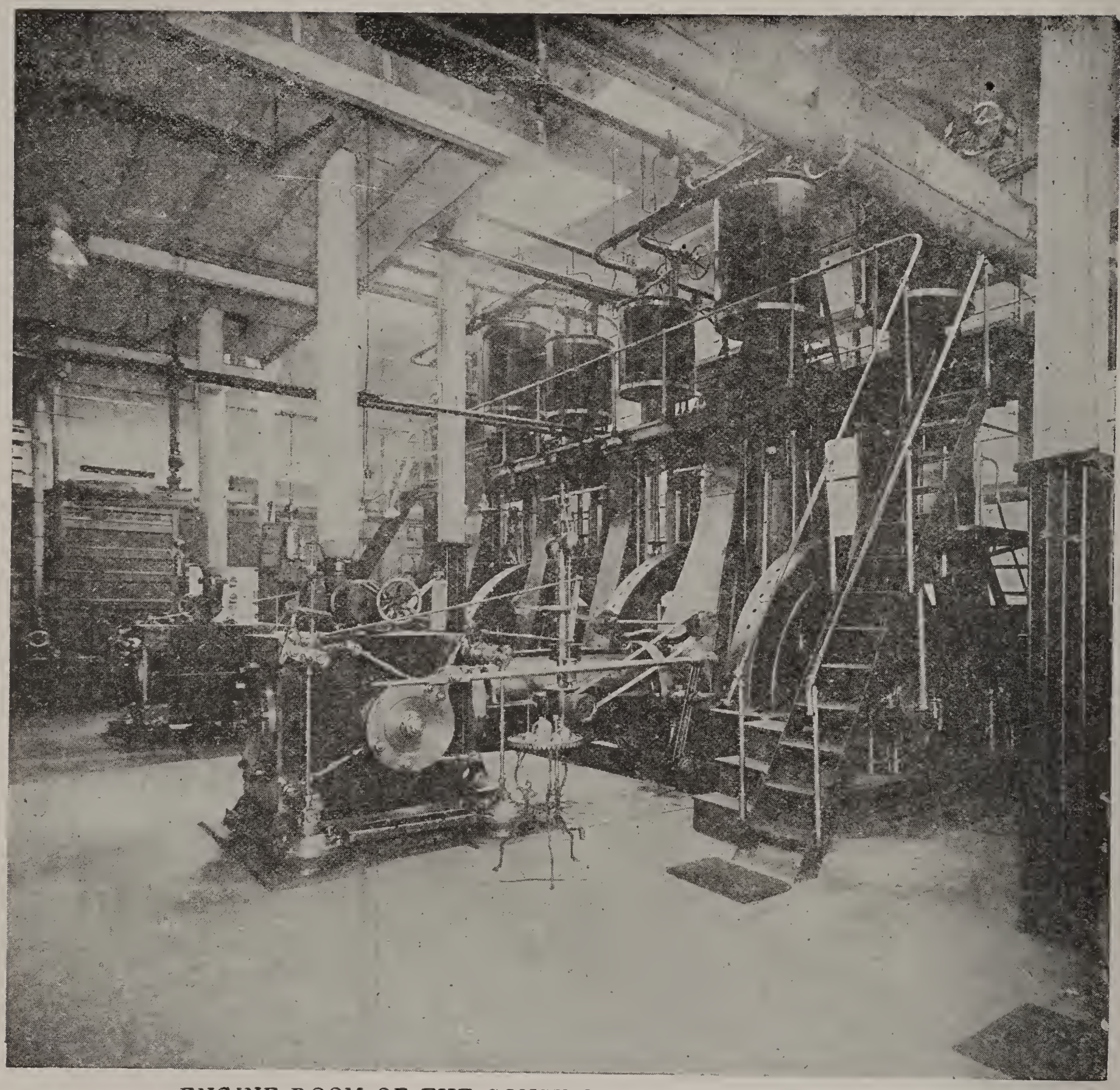


VIEW IN THE FREEZING ROOM

The freezing water is in square tanks beneath the floor. Each tank is block of ice size.

To overcome these deficiencies, D. L. Holden has put into operation a new system which makes ice at 50 cents a ton with space required for a plant of only 25x50 feet, as compared to 100x150 feet for the can system, and a cost by the latter of from $1.65 to $1.85 a ton The

ammonia without loss, and the ice machine. The ammonia system is a combination of the compression and absorption systems. For it there are necessary three vertical pipes, twelve inches in diameter and forty feet high. They are the still, the absorber and the condenser; and



ENGINE ROOM OF THE CONSUMERS COMPANY ICE PLANT.

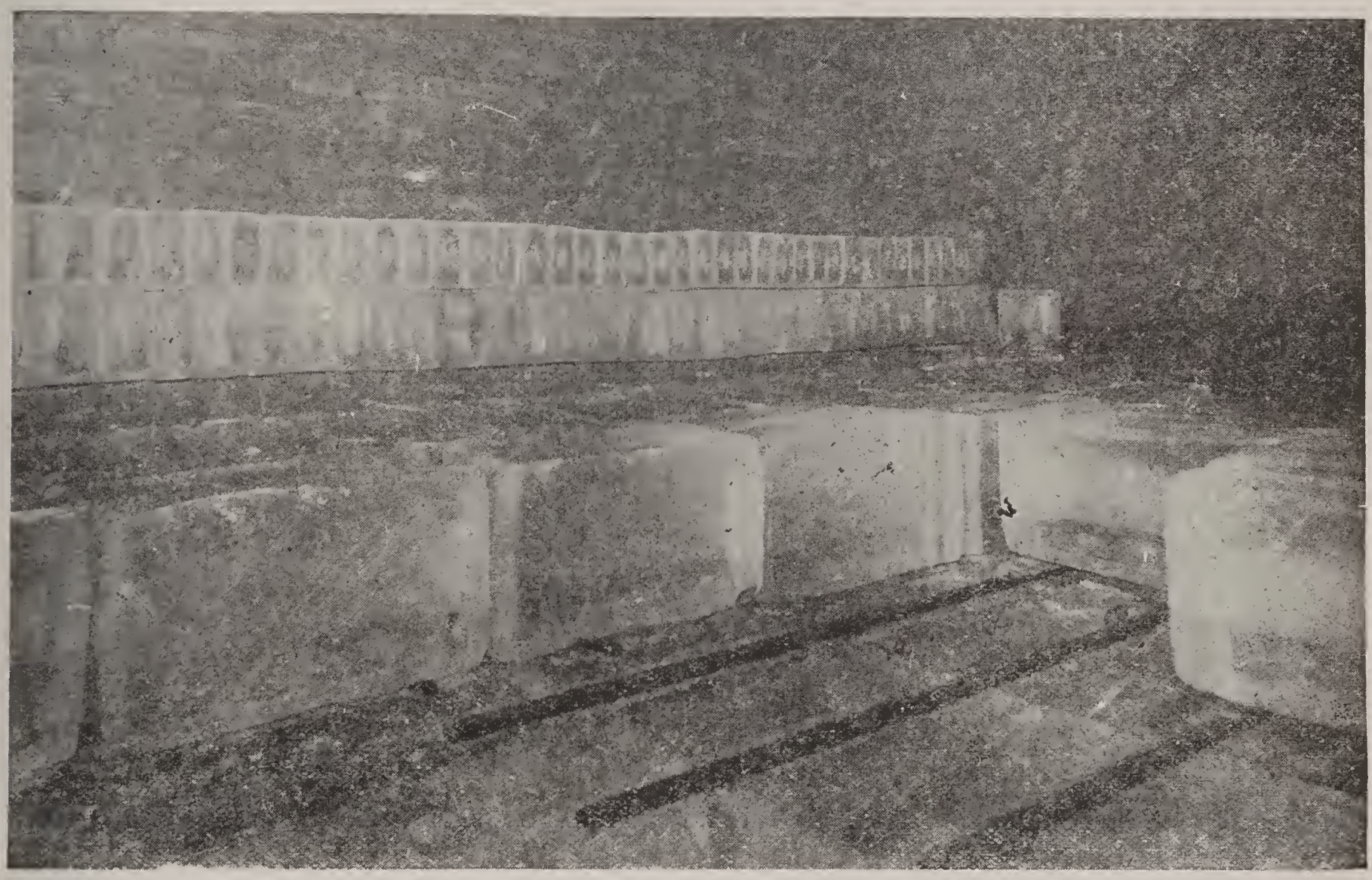
Showing how the ammonia is forced through asbestos covered pipes and kept in circulation in the coils of pipe through the brine into which are placed the tanks of water intended to be frozen.

besides these there are two shorter pipes called the interchanger and the cooler, while an ammonia pump furnishes the power for circulation.

Method of Freezing.

Strong ammonia liquor of 32 degrees Bané intensity is forced by the pump by way of the interchanger, where it is partially heated, up to the top of the still. The still is filled with thirty-six one-inch steam pipes tightly wound with wire. Within the numerous steam pipes are smaller pipes one-fourth of an inch in diameter which carry the steam. When the strong ammonia liquor is emptied at the top of the still it trickles down the sides of the outer pipes, and the wire breaks it up into smaller drops, giving it

larger heating surface. As the ammonia becomes hot it gives off ammonia gas, which rises to the top of the still and passes out by another pipe over to the top of the absorber. This device is also filled with pipes, but they contain circulating water instead of steam. By contact with these pipes the ammonia gas is converted into anhydrous ammonia of exceedingly low temperature, and is ready for the freezing cylinder, which converts it into ice.



VIEW OF THE BLOCKS OF ICE READY FOR DELIVERY TO THE CONSUMERS.

The Ice Machine.

Let us look at the ice machine before we follow the processes of the ammonia plant further. The freezing cylinder, as its name signifies, is a tank 3½x3½x7 feet, filled with water, in which is a hollow cylinder rotating upon hollow trunnions Through one trunnion the anhydrous ammonia is admitted in quantities enough to allow about three inches to be at the bottom of the cylinder all the time. As the cylinder rotates the ammonia clings to its sides, and thus a thin film at all times is absorbing the heat of the water in the tank outside. The difference of 64 degrees F., as noted before, absorbs so much heat from the water that a thin coating of ice is always forming on the outer side of the cylinder as it rotates in the water. To prevent this ice from getting too thick, a set of knives is arranged so that thin shavings or "spawls" are trimmed off as the cylinder turns. These naturally rise to the top of the water in the tank, and by means of a screw conveyor are carried with some water to hydraulic presses, where under 350 pounds pressure to the square inch they are pressed into cakes. The pipe

leading to the two presses has a three-way valve which automatically closes when one press is full and turns the spawls into the other press. The inside of the presses is of perforated brass, which permits of pressing out all the air and water in the spawls and allows the cakes to issue clear as crystal. With such a plant ten tons of ice can easily be turned out each day.

Work of Anhydrous Gas.

After the anhydrous gas has done its work in the freezer and has grown comparatively warm, it escapes by a pipe through the other trunnion of the cylinder to the top of the absorber. We saw how that in the still the hot gas escaped to the top and was carried to the condenser. As this gas arose a weak ammonia liquor was left behind to trickle down the side of the steam pipes and to collect in a small receiver at the bottom. In order to unite this weak liquor with the spent ammonia gas and thus save waste, it must be cooled somewhat. Accordingly the weak liquor is run off from the receiver at the bottom of the still to the bottom of the interchanger, and by means of a set of spiral coils it rises, because of its heat, and, passing upwards, is reduced in temperature, giving off its heat to the strong ammonia liquor that is on its way to be heated. From the interchanger the cooling ammonia is run downward through coils in the cooler, and by pressure is taken to the top of the absorber, where it meets the ammonia gas from the freezing cylinder. This weak liquor is broken up on the wire coils about the pipes of the absorber, and, just as in the still this allowed the gas to escape when heated, now allows the weak liquor and spent gas to reunite into strong ammonia liquor, whence it goes to the ammonia pump ready for the journey once more through the various cycles back to the freezing cylinder.

The ice crop of the United States for 1899 has been estimated at:

	Tons.
Natural ice, cut from streams	6,000,000
Artificial ice, manufactured .	8,500,000
Total	14,500,000

Or, in pounds, 29,000,000,000.

HYPNOTISM.

What It May Accomplish—Method of Hypnotizing—Ridiculous Things the Subject is Made to do.

MUCH interest has been taken during the past few years in the results of psychological research and from this has sprung a special concern in hypnotism. Hypnotic suggestion has proved valuable in the treatment of functional disorders of digestion, absorption and circulation, of nervous condition, and it has assumed importance as an appropriate instrumentality for affecting character change in cases of moral obliquity as well as for developing and exalting mind power. Plainly speaking hypnosis implies a mind condition in which the mental action of a sensitive subject is under the control of an operator who has induced the state. It is characterized by insensibility to outward sounds and images, and to ordinary impressions of sense organs, but by quickened perception of sensations pictured by the hypnotist.

Human beings are hypnotizable by other human beings between whom and themselves exists a peculiar sympathy or harmonious relationship known as rapport. Various methods of inducing hypnotism are practiced, all having in view the fixation of the attention upon some monotonous stimulus of the eye or ear, as sedative music or a bright object like the nickel-plated point-protector of a lead pencil, a transparent crystal, a stud in a shirt bosom, or the eyes of the operator. Perfumes also have hypnotic power; the odor of May blossoms, of new mown hay, of balm-of-Gilead firs, contribute to the induction of mental placidness. Certain colors are also helpful, especially pinks of a low chroma.

Use of the Hands.

In certain instances such a procedure as told above may be supplemented by light passes, or by holding firmly the hand of the patient, by pressing it against the forehead of the operator, or by contact of foreheads, while the whole force of one's personality is concentrated in an effort to overcome an automatic resistance to hypnotization.

Some operators request the patient to take a reclining position on a lounge. Then, by talking soothingly to them for some time, the operator acquaints himself with the dominant propensities of controlling thoughts and above all securing the patient's confidence. Then the patient's attention is concentrated upon a suspended diamond, or some other unique article. The eyes soon become tired from the strain, and the patient is told he is gazing at a sleepy stone which has never failed to induce slumber. Then he is told to think of nothing, to renounce the very intention of renouncing mental effort, and to give himself up with a perfect confidence in the purity of the motives of the operator. Under these conditions the eyeballs soon become fixed, a vacant stare replaces the usual intelligent look, and the eyelids begin to open and close spas-

modically. At this stage the suggestion is given that a prolonged refreshing sleep is about to ensue; and in a few moments a long breath is taken and the lids close with a slow regular movement. Deep inspirations follow, and then the operator knows he has secured the deeper personality of his subject.

Gaining Control.

When a person is under the influence of a hypnotist he may be regarded as in a condition in which the part of the nervous system associated with conscious perception is thrown out of gear, without preventing the kind of movements which would result were the apparatus really in action. Impressions are made on the sensory organs; the sensory nerves convey the impression to a part of the brain. In the deepest condition of hypnotism these impressions may not arouse any consciousness, but the result may be the kind of movement which would naturally follow supposing the person had been conscious. The movements of an hypnotic are usually of an imitative kind. The mere suggestion of a movement has not always proved successful. It must be made before the eyes of the person who is expected to perform the movement. The patient is in a sense an automaton played upon by the operator through the medium of the patient's sensory organs. In deep hypnotism the patient has no idea corresponding to the movements he makes to the example of the operator.

In some cases where the patient is but slightly hypnotized there is a curious combination of feelings. He knows he is being made a fool of, but does many ridiculous things at the bidding of the operator. In some respects he is like a somnambulist who acts the movements of a disturbed dream. After coming back to his original self he remembers all that happened while he was in that state. In some cases, however, the hypnotism is so deep as to resemble coma, and in these there is no trace of sensory impressions or of movements.

Experiments Made.

The experiments that have been made with persons who could be hypnotized have been very curious. The hypnotist would tell them to bark like a dog. They would do this. They would be ordered to crawl on their hands and feet as if they were a horse. They would obey. When told to crow like a rooster they made fairly successful attempts to do so. One subject was told to go and touch a stove. The stove was cold at the time, but the hypnotist told the subject it was hot. The instant the stove was touched the subject cried out with pain, having experienced the sensation of heat.

Paul King, a quite noted hypnotist at one time, having gained control of a lady's mind, told her that he was thinking of something that she very much cherished, and for her to go and get it wherever it was. She was at that time in King's studio with a party of friends She immediately left it in his company and the company of her friends and, still under his influence, went to her home and took from its place on the mantel a portrait of her husband and gave it to King. Experiments like this suggets how far it might be possible for a corrupt person having great hypnotic power to gain control of human minds and influence them for bad. The law has not yet taken cognizance of this phase of hypnotism.

Recent experiments made in New York have led scientists to advance a theory that it would be possible for a hypnotist to cause a subject to die by simply instructing the latter to cease breathing. This would be murder in the eyes of the

law. If this can be done, the suggestion has been made that hypnotism take the place of the eloctrocution chair.

Women, as a rule, hypnotize more easily than men. It is not possible to hyptonize any one without their first mentally consenting or yielding to the influence of the hypnotist.

BRAZIL.

A Rich Agricultural Country—Varied Characters of the Soil—The Inhabitants and Their Religion.

BRAZIL, a Republic in South America, is bounded on the north by Venezuela, British, Dutch and French Guiana; on the east by the Atlantic Ocean; on the south by Uruguay, the Argentine Republic, Paraguay and Bolivia and on the west by Peru and Columbia. Its area is claimed to be 3,209,878 square miles. Its capital is Rio de Janerio. The southeastern portion of Brazil is mountainous, the central, northeastern and western parts consist of a plateau, with the low plains of the Amazon to the north. The principal rivers are the Amazon and its tributaries, Parana and San Francisco, with the Uruguay and Paraguay on the frontiers. Part of the Amazon basin is covered with a dense and rich forest of tropical growths. The principal pursuit of the inhabitants is agriculture. The annual exportations include coffee, sugar, hides, rubber, cotton and tobacco.

The government is a federal republic with a president at its head and having a congress consisting of a senate of 63 members and a chamber of 212 deputies. The country is divided into twenty states and the federal district of Rio

The inhabitants are Brazilians, Indians, negroes, mixed races and colonists from Germany, Italy and Switzerland. The language chiefly spoken is the Portuguese; the religion Roman Catholic. Brazil was discovered by Vincente Yanez

THE BANYAN TREE, SOMETIMES COVERING SEVERAL ACRES.

The northern part of Brazil is famous for its luxuriant vegetation, and many native trees not to be found elsewhere. A great variety of richly flavored nuts are grown in great abundance. The development of this vast country will likely attract the attention of the world during the next several decades.

Pinzon, January 26, 1500, and independently by the Portuguese Cabral in the same year. The country was claimed and colonized by the Portuguese, and was the residence of the exiled Portuguese royal family in the Napoleonic period. In 1822 its independence was proclaimed. An empire was formed with Dom Pedro, son of the Portuguese king, as its first emperor. In 1831 he was compelled to resign and give way to his son, Pedro II. In 1865-1870 Brazil allied with the Argentine Republic and Uruguay, and defeated Lopez of Paraguay. In 1871-1888 slavery was abolished. A revolution broke out in 1889, overthrowing the empire, and compelling the imperial family to leave the country. A provisional government under Fonseca was established. In 1890 a national congress was summoned, and 1891 it proclaimed the Constitution of the United States of Brazil. Fonseca, the first president, assumed control of affairs in 1891, but was compelled to resign. He was succeeded by Peixoto. Revolts have frequently occurred, and in 1893 a serious rebellion of the fleet broke out under Mello.

LARGEST CHRYSANTHEMUM PLANT IN THE WORLD.
Grown in Japan, the home of the flower and valued at $50,000.

EMPEROR'S PALACE AT RIO DE JANEIRO

THE AMERICAN INDIAN.

The Former Occupant of America—Various Tribes and Stocks—Where the Large Reservations are—Numbers Increasing.

THE American Indian was the original occupant of the soil of the North American continent. There were possibly 1,000,000 in what is now the United States when Christopher Columbus came in 1492. There are now about 200,000, of whom less than 50,000 are in the Northwest. The predominant tribes at the present time are the Sioux, Apache, Cherokee, Chippewas, Cheyennes and Shoshones. The original tribes and where they were first located are given herewith:

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Algonkian,	East Canada and United States.
Abnaki,	Nova Scotia.
Arapaho,	Upper Kansas River.
Blackfeet (Siksika),	Upper Missouri River.
Cheyenne,	Upper Arkansas River.
Chippeway,	Lake Superior.
Cree,	south of Hudson Bay.
Delaware (Lenape),	Delaware River drainage.
Illinois,	Illinois River.
Kaskaskia,	Mississippi River below Illinois River.
Kickapoo,	Illinois River.
Menominee,	Green Bay, Mich.
Miami,	between Miami and Wabash rivers.
Micmac,	Nova Scotia.
Mohegan,	Hudson River.

A FAR WEST TOWN WITH INDIANS IN THE FOREGROUND.

The customary saloon and general merchandise store are shown and the rails of a transcontinental line

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Montagnais	East Canada.
Manticoke	East Chesapeake Bay.
Narragansett	Rhode Island.
Ottawa	south of Lake Huron.
Passamaquoddi	Maine.
Piankishaw	middle Ohio River.
Piegan	Upper Missouri River.
Pottawattomi	south of Lake Michigan.
Powhatan	Virginia.
Lipan	Rio Grande, Texas.
Loucheux	Lower Makenzie River.
Mescalero	New Mexico.
Montagnais	Central Canada.
Navajo	New Mexico.
Slave	Makenzie River.
Tinne	Northwest Canada and Alaska.
Attacapan	Texas coast.
Beothukan	New Foundland.

THE CARLISLE COLLEGE FOOTBALL TEAM.

Composed wholly of young Indians being educated by the United States. The swiftest running football team ever got together.

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Sac and Fox	Sac River.
Shawnee (Vagrants)	South Central United States.
Athapascan	Alaska, Canada, California, New Mexico.
Apache	New and Old Mexico, and Arizona.
Chepewyan	South Central Canada.
Hupa	North California.
Jicarilla	New Mexico.
Kuchin	Yukon and Copper rivers, Alaska.
Caddoan	Louisiana, Texas, Nebraska, Dakota.
Adaize	Red River, Texas.
Arikara	Dakota.
Caddo	Texas.
Nachitoches	Red River.
Pawnee	Arkansas River.
Wichita	Red River, Arkansas.
Chimakuan	Puget Sound, Washington.
Chimarikan	North California.
Chimmesyan	Northwest British Columbia.

STOCKS AND TRIBES. ORIGINAL LOCALITY.

Nass and Tsimshian, Skeena and Nassac rivers, British Columbia.
Chinookan, Columbia River, Oregon.
Chitimachan, South Louisiana.
Chumashan, California coast, 34 to 35 deg. North.
Coahuiltecan, Rio Grande mouth.
Copehan, North Central California.
  Wintun, Trinity River, California.
Costanoan (Mutsun), south of Golden Gate, California.
Eskimoan, Arctic coast.
Esselenian, south of Monterey Bay, California.
Iroquoian, the Great Lakes and Carolina.
  Cayuga, south of Lake Ontario.
  Acoma, Laguna and other Pueblos, New Mexico.
Kiowan, Nebraska and Wyoming.
Kituanahan, East British Columbia.
  Kutenay, British Columbia.
Kolushan, Southeast Alaska.
Kulanapan (Pomo), coasts of California, 39 deg. North.
Kusan (Coosan), Coos Bay and River, Oregon.
Lutuamian, Klamath Lakes, Oregon and California.
  Klamath and Modoc.
Mariposan (Yokut), Tulare Lake, California.

A PANEL PICTURE OF AMERICAN INDIANS ON THE WARPATH.
Showing their method of riding, their costume and their swift running ponies.

STOCKS AND TRIBES. ORIGINAL LOCALITY.

  Cherokee, North Carolina, etc.
  Conestoga, South Susquehanna River.
  Erie, south of Lake Erie.
  Huron, between Lake Ontario and Huron.
  Mohawk, East New York.
  Neutral Station, west of Niagara River.
  Oneida, Central New York.
  Seneca, Central New York.
  Susquehannock, head of Chesapeake Bay.
  Tuscarora, migrated to New York from Virginia.
  Wyandot, between Lake Ontario and Huron.
Kalapooian, Willamette River, Oregon
Karankawan, Matagorda Bay, Texas.
Keresan, New Mexico.
Moquelumnan, interior of California.
Muskhogean, Gulf States, east of Mississippi River.
  Chickasaw, Upper Mobile River.
  Chictaw, between Mobile and Mississippi Rivers.
  Creek (Muskoki), between Mobile and Savannah rivers.
  Seminole, Florida.
  Yamasi, South Carolina coast.
Natchesan, present site of Natchez.
Palaihnihan, Pitt River, Northeast California.
Piman, east shore, Gulf of California.
  Opata, Sonora, Mexico.
  Papago, Rio Gila, Arizona.

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Pujunan,	East Sacramento River, California.
Maidu,	Sacramento River, California.
Quorateau,	Klamath River, California.

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Atnah,	Fraser River.
Bellacoola,	British Columbia coa
Clalla,	Washington State.
Lummi,	Washington State.

A PERFECT TYPE OF THE AMERICAN INDIAN.

Showing a chief in his robes of authority holding his calumet or peace pipe and having his war bonnet and blanket conspicuously displayed.

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Salinan,	east of California, 35 to 37 deg. North.
Salishan,	Washington, British Columbia and Montana.

STOCKS AND TRIBES.	ORIGINAL LOCALITY.
Nisqualli,	Washington State.
Many tribes with names ending in "ish."	
Sastean,	Middle Klamath River, California.

STOCKS AND TRIBES. ORIGINAL LOCALITY.

Shasta, Klamath River, California.
Shahaptian, Upper Columbia River, Oregon, etc.
Klikatat, Middle Columbia River.
Nez Perce, Middle Columbia River.
Shoshonean, Great Interior Basin.
Bannock, Montana.
Chemahuevi, Colorado River Agency, Arizona.
Comanche, Northern Texas.
Moki (Hopi), Northeast Arizona.
Pai Ute, Utah.
Snake, Idaho and South Oregon.
Ute, Utah.
Siouan, chiefly Missouri River drainage.
Assiniboin, Saskatchewan River.
Biloxi, Mississippi.
Catawba, North and South Carolina
Crow, Yellowstone River.
Dakota, Upper Mississippi River.
Iowa, Iowa River.
Kansas (Kansay), Kansas.
Mandan, Upper Missouri River.
Minnetaree, Yellowstone River.
Ogallala, Missouri River.
Omaha, Elkhorn River.
Osage, Arkansas and Osage rivers.
Otoe, Platte River, Nebraska.
Ponca, Middle Missouri River.
Quapaw, Lower Arkansas River.
Teton, Missouri River.
Tutelo, Roanoke River, Virginia.
Winnebago, west of Lake Michigan.
Skittagetan, Queen Charlotte Islands.
Haida, Queen Charlotte Islands.
Kaigani, Queen Charlotte Islands.
Takilman, Rogue River, Oregon.
Tanoan, New Mexico.
Taos and other Rio Grande Pueblos, New Mexico.
Timuquanan, Florida Peninsula.
Tonikan, Lower Yazoo River, Mississippi.

STOCKS AND TRIBES. ORIGINAL LOCALITY.

Toukawan, West and Southwest Texas.
Uchean, Savannah River, Georgia.
Waiilatpuan, Wallawalla River, Oregon
Wakashan, Vancouver Island and British Columbia.
Aht, Vancouver Island.
Haeltzuk, British Columbia.
Washoan, Northwest Nevada.
Weitspekan, Lower Klamath River, California.
Wishoskan, Mad and Eel rivers, California.
Yakonan, coast of Oregon.
Yanan, coast of Oregon.
Yukian, Round Valley, California.
Yuman, Lower California and Mexico.
Cocopa, Colorado River mouth.
Diegueno, San Diego, California.
Havasupai, Lower Colorado River.
Maricopa, Gila River, Arizona.
Mohave, mouth of Colorado River.
Zunian, New Mexico.

The last census shows that most of the Indian tribes are increasing in number and not decreasing. The government has opened many Indian schools like that of the famous Carlisle at which the Indian children are educated free of charge. There are also schools on the reservations. The Indians still hold in their own name many million acres of land and quite a number have taken to farming. The great Indian reservations of the country are now in Indian Territory, Oklahoma, Wisconsin, Northern Minnesota, both of the Dakotas, Montana, Wyoming, Colorado, Arizona and New Mexico.

MODERN ART.

Art, What It Is—Various Divisions and What Constitutes Each—Meaning of a Work of Art.

ART is the production or construction of objects. Black art, necromancy, sorcery, is the fancied power of performing wonderful feats by preternatural means, especially means derived from the assistance of the powers of evil. Decorative art is that branch of art which has for its primary object merely the pleasure of the eye, especially in decoration which is subservient to architectural features or to form, as in ceramics. Fine arts are those arts that seek expression through beautiful modes; specifically architecture, sculpture, painting and engraving. Plastic arts, sculpture, including all subordinate or related arts by which objects are represented in the round or in relief. A work of art is anything in the formation or into the accomplishment of which art in any sense has entered.

Some famous modern masters of art and their works are: Henry's Chicago; Wendt's Autumn; Werthener's Lion and Butterfly; Clement's Circassienne; Fery's Niagara Falls; Flagg's Hebe; Turner's Sunset and Reynold's English Maid.

While European artists still lead the world in painting the works of American artists are beginning to attract great attention, not only at home but abroad. A large number of American painters exhibited at the recent Paris Exposition and received various medals of honor. One of the best known American painters whose portraits sold in the galleries of England and France was G. P. A. Healy, who died a short time ago. Mr Healy's early art work was in Chicago. He ranked as one of the best of modern portrait painters.

THE ATELIER OR STUDIO OF AN ARTIST.

Showing his canvas, method of dress and arrangement of the room.

MEXICO.

Location, Character of Soil—Leading Industries—Early Inhabitants—Principal Historical Events—Present Inhabitants.

MEXICO is bounded on the north by the United States, on the east by the Gulf of Mexico and the Caribbean Sea, on the south by British Honduras, Guatemala and the Pacific Ocean, and on the west by the Pacific Ocean. Its capital is the City of Mexico. It comprises the peninsulas of Lower California and Yucatan, aside from the main portion, and has a complete area of 767,005 square miles. The surface is generally a tableland traversed by high mountain ranges. Silver, gold, copper and lead comprise the principal mineral products. In the north the inhabitants are chiefly engaged in agricultural pursuits and live-stock raising. Sugar, maize, coffee, tobacco and hemp are grown.

Mexico is divided into twenty-seven states, one federal district and two territories. It has a republican form of government (modeled after that of the United States), with a president at the head of the government. It has also a congress (senate of two members from each state, and lower house of 227 members).

The early inhabitants were Aztecs and other native races. The present inhabitants are chiefly creoles of Spanish descent, Indians and mixed races, including Mestizos and Zambos. The predominant language is Spanish; religion, Roman Catholic.

The chief events in the history of Mexico are the invasion of Cortez in 1519; conquest of the capital in 1521; the country made a

A COFFEE PLANTATION IN OLD MEXICO.
Showing tropical foliage and the ruins of an ancient gate.

THE CUT OF NOCHISTONGO, MEXICO.

Blasted out of solid rock for railroad passage. The cut is 200 feet deep.

Spanisn colony under the name of New Spain, and after 1535 a viceroyalty; revolution under Hidalgo begun in 1810; guerrilla warfare until the revolution under Iturbide in 1821; last Spanish viceroy deposed in 1821; empire under Iturbide, 1822-1823; secession of Texas, 1836; war with the United States, 1846-1848; after this there were frequent changes of government for some time; foreign intervention in 1861; war with France commenced, 1862; empire under Maximilian upheld by French troops, 1864-1867, French troops withdrawn in 1867; restoration of the republic in 1867.

In portions of Mexico where the rainfall is sufficient the vegetation is rich and of a tropical character. Extensive forests abound in valuable timbers, dyewoods and medicinal plants. There are mahogany, rosewood, copal, caucho (India-rubber), sarsaparilla and vanilla trees and plants.

The fauna of Mexico is composed of several varieties of the bear, the wolf, coyote, skunk, bison, squirrel, marten,

COTTON MILLS OF HERCULES, MEXICO.

Showing the great court yard.

otter, rattle-snake, mocking-bird and many wild fowl similar to those of northern regions, while the monkey, puma, jaguar, sloth, tapir, alligator, boa, scorpion, tarantula, parrot, trogan identify it with the tropical regions. European domestic animals thrive well in Mexico—cattle, sheep and horses being found on the ranches of the northern states.

The city of Mexico, the capital, is the largest and finest in all Spanish-America. Its streets are broad, well paved and lighted. Here is a cathedral, one of the largest in America, founded in 1573 and completed in 1657. And here too are picture galleries, convents, schools and libraries whose age and history make them points of interest and instruction, as well as fascination. The industries of the City of Mexico are varied, its climate equable, but its drainage not very good.

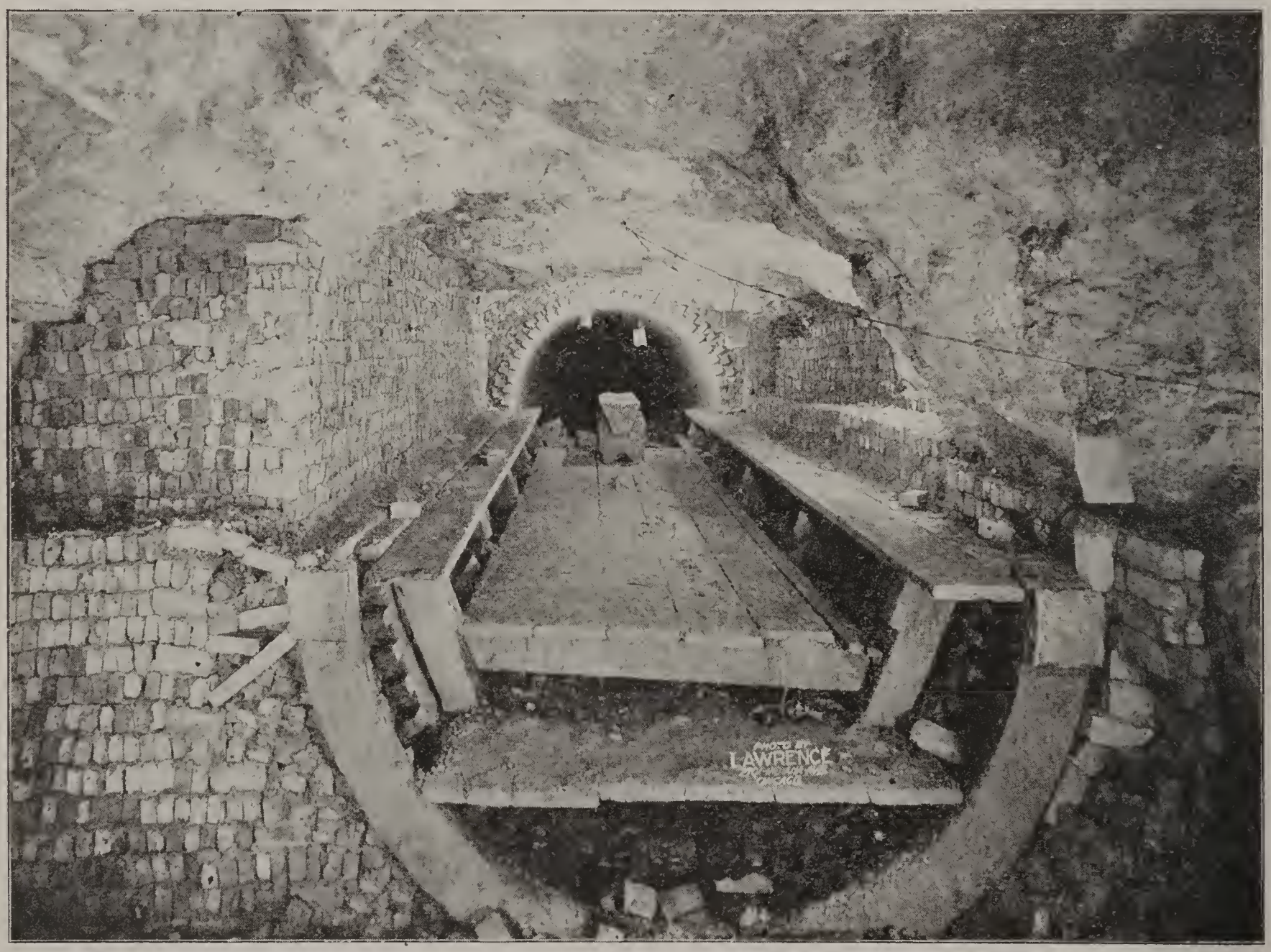
A TROPICAL ROAD THROUGH A COFFEE PLANTATION.
Near Cordova, Old Mexico; tropical foliage shown.

The city dates from either the year 1325 or 1327 when the Aztecs first gathered there in the form of a settlement. With the advent of the Spanish in 1519 the city became the scene of many revolutions but since the death of Maximilian peace has been restored and Mexico has become a city of refining and civilizing influence over the natives.

WATER SUPPLY.

How a Great City Drinks—Underground Tunnels Built—Lake Supply is Drawn Upon—Billions of Gallons Used Annually.

THE city of Chicago contains one of the most wonderful water-works systems in the world, and may be used as an illustration of how the many people in the large cities are supplied with their drinking and bathing liquid, as well as fire protection. The city of Chicago draws its water supply from Lake Michigan. Buildings are erected in the lake, two, four and six miles from the shore line. These buildings have foundations which extend to the bottom of the lake and below that bottom fifty, sixty and seventy feet. At the bottom they connect with underground tunnels built from the land. The



A HALF SECTION OF AN UNDERGROUND WATER TUNNEL OF THE CITY OF CHICAGO.
Through this the water used by the city is conveyed from Lake Michigan.

water which the city is to drink goes into these buildings, which are called cribs, and passes through gratings to the tunnels. The gratings are used to keep out floating timbers, debris and ice.

The water flows through these tunnels to the land, where there are pumping stations. The pumps of these stations gather this water up and force it into the mains leading through the streets. These mains or pipes convey the water to the private residences. Hydrants, or upright pipes, are placed at the various street corners, and these connect with the mains and are used for fire engines. Since the construction of the drainage channel, which carries all of Chicago's sewage away from the lake, the city has secured one of the best water supplies in the world. The pumping engines of the city each furnish 20,000,000 gallons of water a day when in service. The city, which has 2,000,000 inhabitants, uses about 90,000,000,000 gallons of water a year. It has nearly 2,000 miles of water mains or pipes. Each one of its fire engines has a capacity for pumping 1,100 gallons of water per minute upon a fire. The water department pays its own expenses through its revenue from the water it sells. The city owns the water plant, and this plant is a practical illustration of the value of municipal ownership.

PANORAMA OF THE LAKE FRONT, CHICAGO.

But a few years ago a part of the lake.

THE LARGEST LOCOMOTIVE.

Where Built and How it Compares With Other Engines—Dimensions and Capacity —Some Rivals.

THE illustration on page 280 shows the gigantic proportions of the engine that holds the world's record for size, weight and power. It was built by the Pittsburg Locomotive Works for the Pittsburg, Bessemer and Lake Erie Railroad. The table on p. 279 is a comparison with the three other next largest engines showing how much this surpasses them.

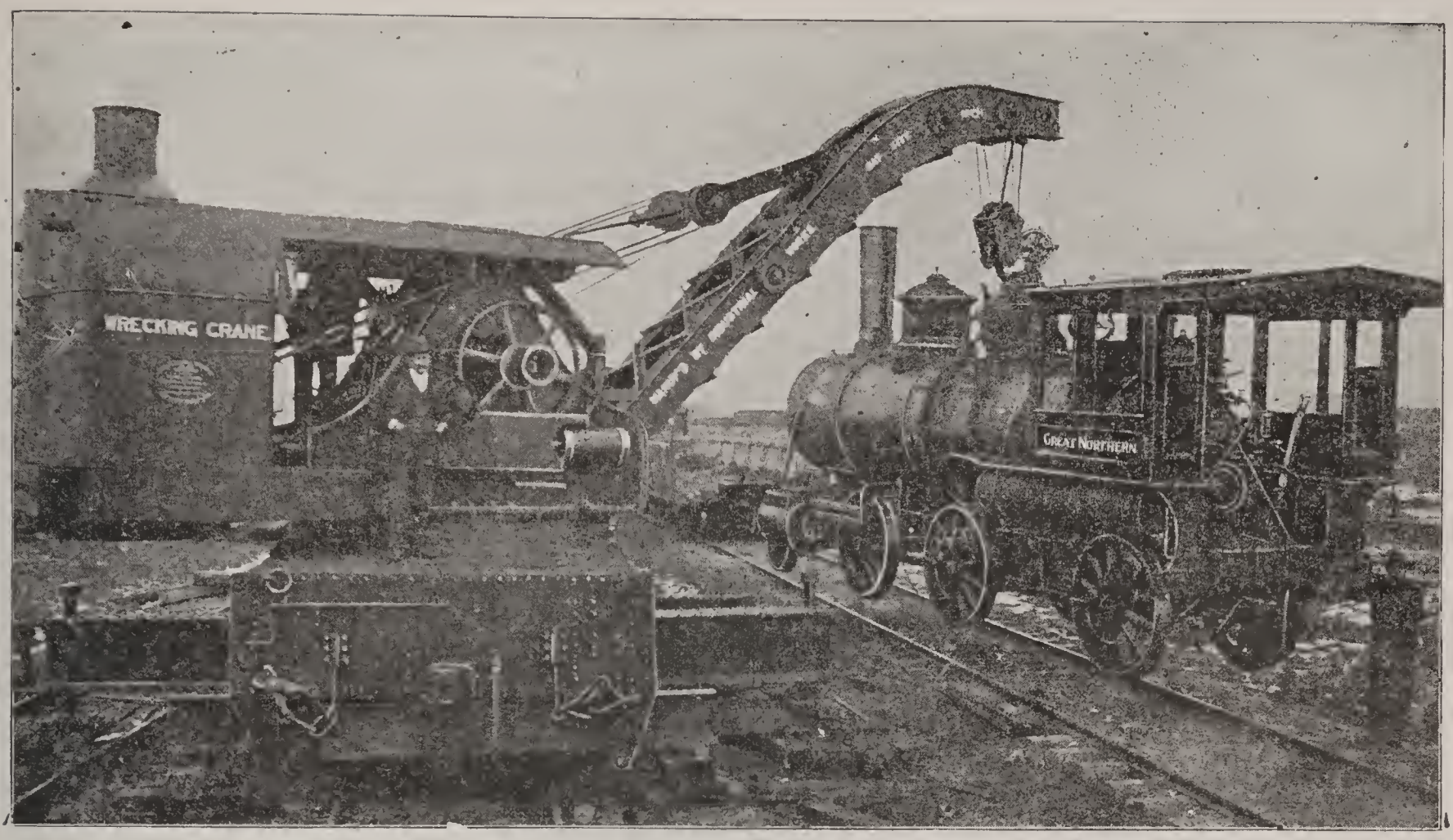
Engine 151 is meant for hauling exceptionally heavy loads of ore and iron at moderate speed. Its net hauling capacity on a level track is 7,847 tons. When the engine is working to its full power there is a pull on the draw bar of 56,300 pounds.

A Rival Monster.

All the great railway systems of this country are after big locomotives. This is a picture also of a type of Illinois Central locomotive that came from

THE FIRST RAILWAY IN AMERICA.

Not constructed for fast travel, comfort, nor heavy hauls. The engine, though, was called the "Rocket."



A GIANT WRECKING CRANE.

Used in moving great masses of iron and steel. It is now lifting a derailed locomotive to the track.

the shops. When it first touched the rails it was the biggest locomotive in the world, but so rapid has been the increase in size of these mechanisms that there is now at least one, if not others, larger. Still, so far as bigness is concerned, this monster, which is now hauling freight on the Illinois Central, will serve as a capital illustration of what the skilled mechanics of to-day can do.

Railroad.....	P. B. & L. E.	Union Railroad.	Illinois Central.	Lehigh Valley.
Builders.....	Pittsburg	Pittsburg	Brooks.	Baldwin.
Size of cylinders..	24 x 32 in.	23 x 32 in.	23 x 30 in.	18 and 30 x 30 in.
Total weight.....	250,300 lb.	230,000 lb.	232,200 lb.	225,082 lb.
Weight on drivers.....	225,200 lb.	208,000 lb.	195,200 lb.	202,232 lb.
Total weight of engine and tender.....	391,400 lb.	334,000 lb.	364,900 lb.	346,000 lb.
Tractive power based on 25 per cent of adhesive weight....	56,300 lb.	52,000 lb.	48,300 lb.	50,558 lb.
Net hauling capacity on level at 10 miles per hour.....	7,847 tons.	7,261 tons.	6,717 tons.	7,019 tons.
Ratio of tractive power to adhesive weight....	4	4	4	4
Percentage of efficiency.....	100	92.5	85.6	89.8

The mathematics of this locomotive are: Cylinders, 23 inches by 30 inches stroke; the driver are 57 inches, or nearly 5 feet in diameter; the boiler front end is 82 inches in diameter; the weight on the drivers is 193,200 pounds, on the trucks, 39,000 pounds, total engine weight, 232,200 pounds; the tender load is 132,700 pounds; the manufacturing company is the Brooks; the total weight of the engine and tender is 364,900 pounds; the tractive power, based on 25 per cent of adhesive weight, is 48,300 pounds, and the net hauling capacity on the level is 6,717 tons.

This locomotive will easily haul sixty loads under oirdinary conditions and sixty-five or more under extraordinary conditions. The Pittsburg, Bessemer and Lake

Erie road has secured two larger engines of the same consolidation type. They have a total weight of engine and tender of 391,400 pounds, or a weight on drivers of 225,200 pounds and on truck wheels of 25,100 pounds, or total engine weight of 250,300 pounds; the cylinders are 24 inches in diameter and the piston stroke 32 inches; the diameter of the drivers is 54 inches; the working pressure of the boilers is 220 pounds; the fire-box has a length of 132 inches, a width of 40¼ inches. These locomotives are to be used in ore and iron traffic, their duty being to haul great train loads at moderate but regular speed.

THE LARGEST LOCOMOTIVE IN THE WORLD.

Owned by Pittsburg, Bessemer & Lake Erie road. Can haul eighty loaded cars of freight over a thirty-six foot to the mile grade.

Mountain Giants.

The Union Pacific has secured some monster engines, having a total weight of 334,000 pounds each and with great capacities for work on the mountain grades of the line. The Northwestern, the Burlington and the Rock Island railroads are making extensive additions of big locomotives to their systems, some for freight hauls and others for passenger traffic. That the biggest locomotive which can be safely and economically handled has yet been constructed master mechanics do not believe. The limit line is some distance away, but with the western roads pushing fast to reach it. The master mechanics of a number of roads have commissions from their companies to exert themselves in devising plans for improved locomotives of a maximum capacity, and they are working each to outstrip the other. The tendency of the time in this direction is not so much toward high-speed locomotives as for those having great hauling capacity.

BUSHMEN.

Strange Aboriginals of Africa—Semi-Savage Tribes—They Live in the Interior—Strange Habits and Customs.

THE Bushmen of Africa are also called San. The language of the San is evidently a sister branch of the Khoikhoin, the name applied to the Hottentots. It is poorer and less regular in grammatic forms than the Khoikhoin language, but richer in clicks. The dialects diverge considerably. The Bushmen are known by different names, according to the Bantu tribes, on whose skirts they live. Thus they are known to the different tribes as Aba-tua, Ba-rua. The names Ba-tua, Ba-kua, and Ba-tshua are most generally given to the Pygmies and Bushmen from Galla-land to the Cape. Owing to the fact that the Pygmies and Bushmen speak the dialects of their Bantu neighbors, most of the Pygmy vocabularies given by travelers are

A TRIBE OF BUSHMEN OF THE INTERIOR OF AFRICA.
Having a dialect peculiar to themselves. They are composed of many tribes.

Bantu. The principal Bushmen tribes are the Ba-Bumantsu in Basutoland; the Ba-Lala in Bechuanaland; the Ma-Denassana, serfs of the Ba-Mangwato, of Chuana stock; the Ma-Sarwa in the Kalahari desert; the Ba-Kankala in the Kunene valley; and the Ba-Kasekele northeast of them. It is not yet settled whether the Ba-Kuise, Ba-Kuando and Ba-Koroka, near Mossamedes, southern Angola, are Bushmen or degenerated negroes.

WEIGHTS AND MEASURES.

STANDARD of measure is a brass scale 82 inches in length, and the yard is measured between the 27th and 63d inches of it, which, at temperature of 62 degrees, is a standard yard.

LINEAL.

12 inches = 1 foot.
3 feet = 1 yard.
5.5 yards =1 rod.
40 rods = 1 furlong.
8 furlongs =1 mile.

GUNTER'S CHAIN.

7.92 inches = 1 link.
100 links = 1 chain, 4 rods, or 22 yards.
80 chains = 1 mile.

ROPES AND CABLES.

1 fathom = 6 feet.
1 cable's length = 120 fathoms.

Standard gallon measures 231 cubic inches, and contains 8.338,582,2 avoirdupois pounds, or 58.372 Troy grains of distilled water, at temperature of its maximum density, 39.10, barometer at 30 inches.

Standard bushel is the Winchester, which contains 2,150.42 cubic inches, or 77.627,413 pounds avoirdupois of distilled water at its maximum density. Its dimensions are 18.5 inches diameter inside, and 8 inches deep: and when heaped, the cone must not be less than 6 inches high, equal 2,747.915 cubic inches for a true cone.

A struck bushel contains 1.244,45 cubic feet.

NAUTICAL.

1 ton displacement in Salt water = 35 cubic feet.
1 ton registered internal capacity = 40 cubic feet.

DIMENSIONS OF A BARREL.

Diameter of head, 17 inches; bung, 19 inches; length, 28 inches; volume, 7,689 cubic inches, or 3.5756 bushels.

MISCELLANEOUS.

1 cubic foot = 7.480,5 gallons.
1 bushel = 9.309,18 gallons.
1 chaldron = 36 bushels, or 57.244 cubic feet.
1 cord of wood = 128 cubic feet.
1 perch of stone = 24.75 cubic feet.
1 quarter = 8 bushels.
1 load of haw or straw = 36 trusses.

WEIGHT OF MEN AND WOMEN.

The average weight of 20,000 men and women, weighed in Boston in 1864, was: Men, 141.5 pounds; women, 124.5 pounds. Average of men, women and children, 105.5 pounds.

WEIGHT, FINENESS, ETC., OF U. S. COINS

Gold.

Denomination.	Weight of Coin.		Weight of Pure Metal.
	Oz.	Grains.	Grains.
Dollar.....	.05375	25.8	23.22
Quarter Eagle	.134375	64.5	58.05
Three Dollar	.16125	77.4	69.66
Half Eagle	.26875	129	116.1
Eagle	.5375	258	232.2
Double Eagle.....	1.075	516	464.4
Silver.			
Dime.....	.080375	38.58	34.722
Twenty Cents	.16075	77.16	69.444
Quarter Dollar....	.2099375	96.45	86.805
Half Dollar	.401875	192.9	173.61
Trade Dollar.....	.875	420	378
Silver Dollar	.859375	412.5	371.25

Copper and Nickel.

	Weight.	Copper.	Tin and Zinc.
	Grains.	Per cent.	Per cent.
One Cent.....	48	95	5
Two Cents.....	96	95	5
Three Cents.....	30	75	25
Five Cents.....	77.16	75	25

Standard of gold and silver is 900 parts of pure metal and 100 of alloy in 1,000 parts of coin.

Fineness expresses quantity of pure metal in 100 parts.

Remedy of the mint is allowance for deviation from exact standard fineness and weight of coins.

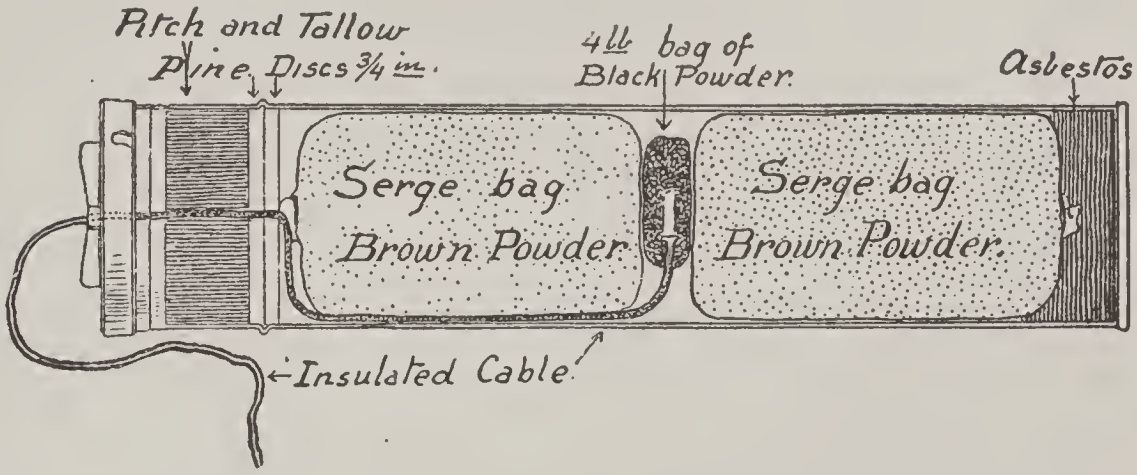
Pure gold, 23.22 grains = $1.00. Hence value of an ounce is $20.67.183+.

Standard gold, $18.60.465+ per ounce.

FIRING A BLAST.

How the Torpedo is Made—Some Knowledge of Chemicals Necessary—Much Care Required—Premature Explosions to be Feared.

IN the old days in firing a blast miners simply laid a train of powder from the charge to a safe distance, then lit this train and fled for safety. Sometimes an explosion followed and sometimes it did not. The modern method is much quicker and safer. An insulated electric cable connected with a battery located some distance from the blast is placed in a cartridge. This cartridge contains two bags of brown powder. The base of it is asbestos, to prevent the contents from being overheated during transportation. The firing end it covered with pitch and tallow and a pine disk to prevent the moisture from getting in. When it is desired to have a blast, the cartridge is inserted in a prepared hole, a key on the electric battery is touched, the electric spark flies along the cable, the powder is set on fire, and the discharge follows. These cartridges rarely prematurely explode. But, like all explosives, they must be handled with care.



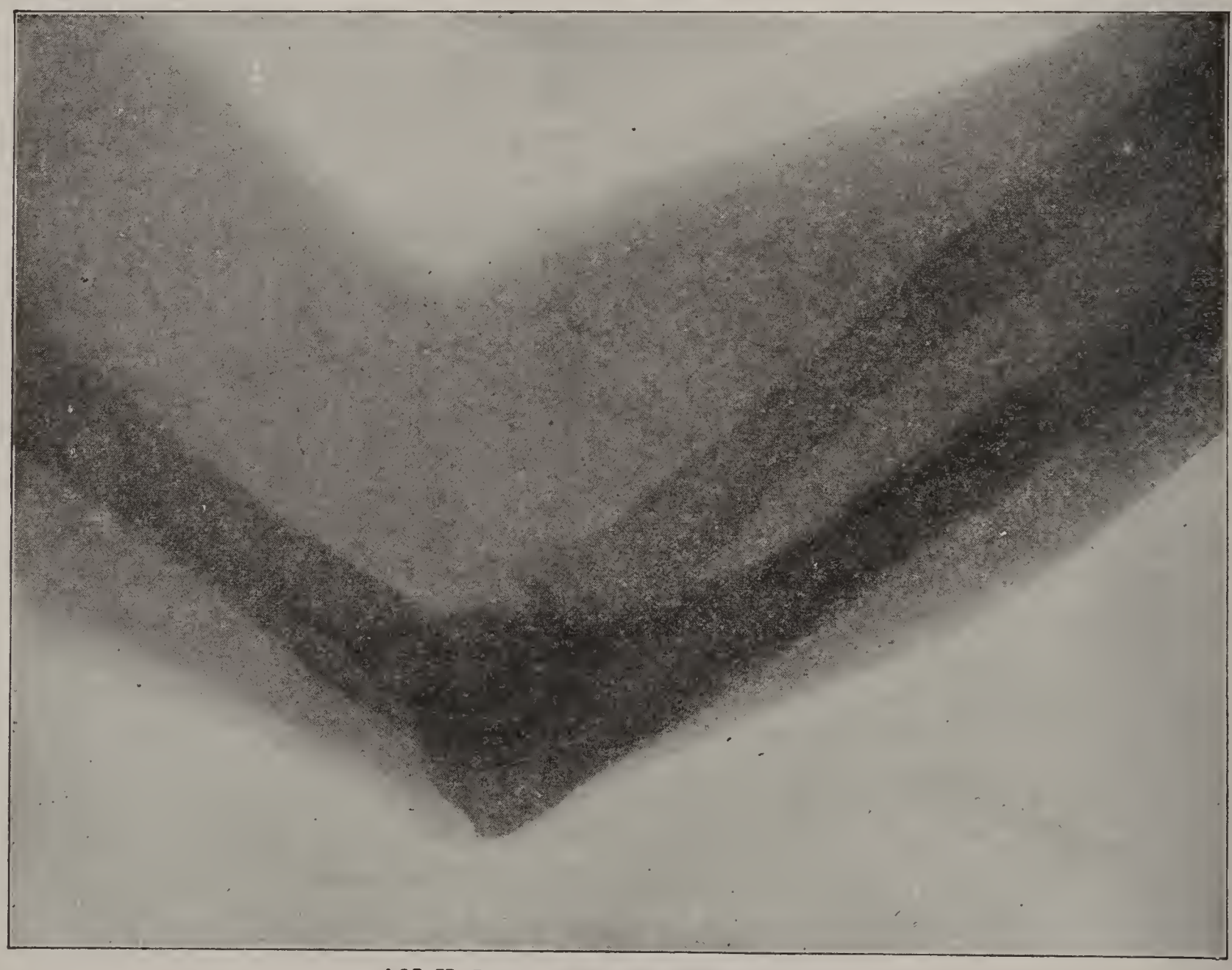
MODERN CARTRIDGE USED IN FIRING BLASTS.

It contains two bags of brown powder, the base of the cartridge being of asbestos and the firing end covered with pitch, tallow and a pine disk.

THE X RAY.

Penetrates the Body—Used by Physicians In Determining Nature of Internal Troubles—Apparatus Used.

FOR years it was difficult for science to determine the exact nature of internal ailments of human beings. Until recently it has not been possible for the physician to see the interior of the lungs, to trace the final location of a bullet, to determine just where a bone was fractured, to find lesions, or muscular troubles. It it now possible to examine the internal structure of the body through the discovery of the Roentgen X-ray. This is nothing more or less that a powerful electric light forced by apparatus through the body so that the interior is revealed to the naked eye. It has been possible to use the X-ray so that a bullet lodged in the heart of a man was not



AN X RAY OR ROENTGEN RAY.

Upon the bones and joint of the arm, showing the elbow socket and covering of flesh.

only photographed before it was removed, but was then taken out and the man still lived. This operation was performed in Chicago three years ago.

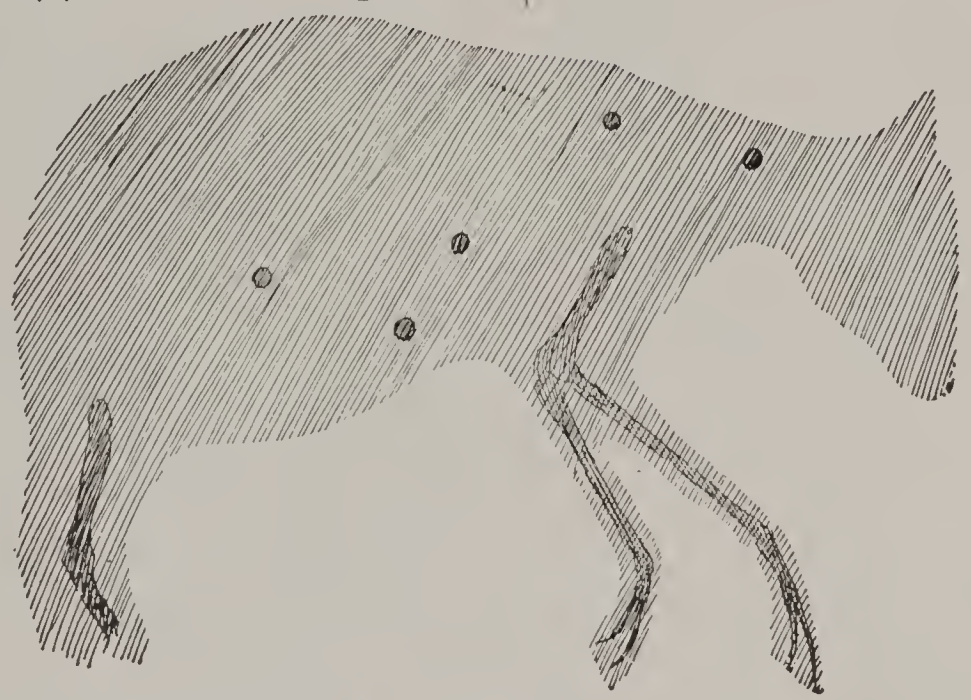
Broken ribs have been discovered with this powerful light, and the location of pins and needles which have got into the body somehow. The condition of the lungs may be determined and foreign growths be found. The use of the X-ray is not objectionable nor painful to the patient, and has advanced the art of surgery a thousand years. It is one of the most wonderful discoveries of the nineteenth century, and is now used in all of the principal hospitals of the United States and Europe.

For developing the electrical force necessary to produce the X or electrical ray a static electric machine may be used. The current developed is passed through a Crookes' tube, which is applied to that part of the body desired to be illuminated. Over the part of the body illuminated by the ray is placed a flouroscope. This flouroscope is nothing more than a photographer's cap which fits closely to the eyes of the operator and shuts out light The operator is then enabled to see the illumination upon the body of the patient and to examine the desired parts. The static electric machine when developing the X-ray is making from 1,200 to 1,500 revolutions per minute. In the first use

THE ROENTGEN OR X RAY.

:owing how it reveals the bones and joints of the hand and wrist. The shadow seemingly upon them is the flesh.

made of the X-ray there was great danger of severely burning the patient with the electrical current developed. This has now been obviated through the use of the static machine. The Crookes' tube was invented by Sir William Crookes of England. He was a noted chemist. He discovered thallium in 1861, and invented the radiometer in 1874. He was knighted by the queen in June, 1897. It is now possible with the X-ray, if a person has swallowed a button, or a bone is lodged in the throat, or foreign and injurious substances are introduced into the body, to readily see the same and to remove them with less injury to the body than ever before.



PHOTOGRAPH OF A SHOT INSIDE OF A RAT'S BODY

DENTAL SURGERY.

Importance of Care of Teeth—Effects of Bad Teeth—Dental Surgery a Science.

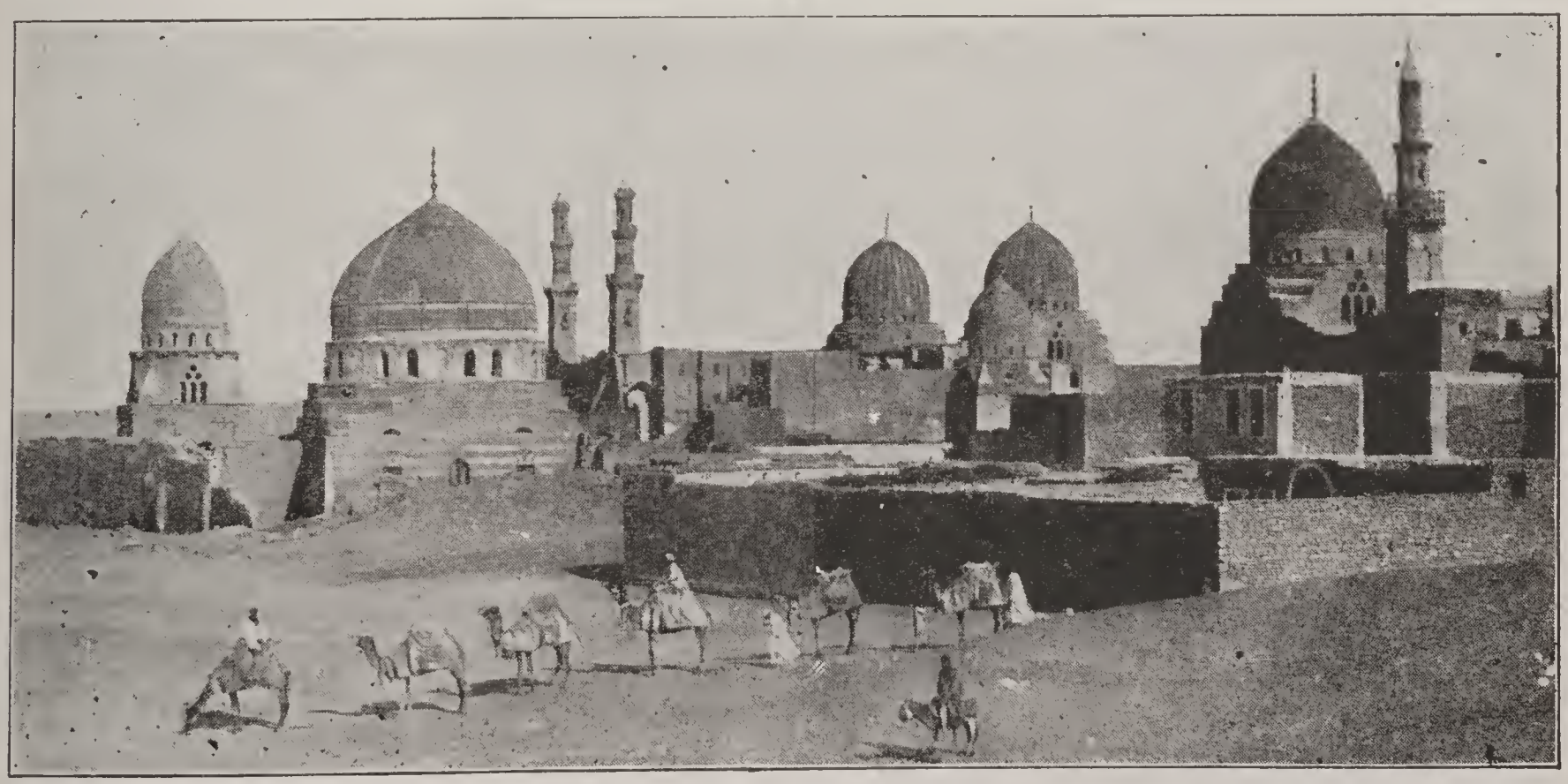
THE care of a mouth is now considered to be one of the first duties of a human being. It is known that a bad condition of the teeth seriously disturbs the stomach, may affect the eyesight, may injure the hearing, produces headaches, and often leads to general bad health. Dental surgery is becoming a science of the first class, and it is now possible to have much of the mouth treated with very little pain on the part of the patient, or any of the excruciating shocks of olden times. Large dental schools are to be found in all of the great cities, and in these students work learning the structure of the mouth and how to extract or rebuild the teeth.

They take the same kind of a course of study one would in mastering any other profession in college, and when graduated receive diplomas. Many of these dental schools contain 400 or 500 pupils. But as every person in ordinary health has thirty-two teeth in his head, it can be understood that the supply of good dentists is rarely too great. The people of the United States are said to put more money into their teeth than any other people in the world. Among the poor in Europe dentistry has made very slow progress.

BAGDAD.

Once a City of Great Importance—The Center of Arabic Culture and Learning—An Important Commercial Point.

BAGDAD, the Persian name meaning "Gift of God," is the capital of the province of Bagdad. The province of Bagdad is located in the lower valleys of the Euphrates and Tigris, between Persia and Arabia. The city of Bagdad was formerly an important one, and is still quite a commercial point. It was founded in 762 by Abu Jaffar, called "Al-Mansur," "the Victorious." Abu Jaffar was the second calif of the dynasty of the Abbassides, and Bagdad remained the capital of the Abbassides for five hundred years. During that time it bore the name Mansurijeh, also Dar-es-Selam, meaning "Dwelling of Peace." Under the Abbassides it became the center of Arabic learning and civilization, and the glory of the eastern world. When it was most prosperous, its walls harbored as many as a million and a half of people. With the fall of the Abbissides dynasty, Bagdad declined and fell into the hands of the Mongols in 1258.



TOMBS OF THE CALIPHS OF BAGDAD, AT PORT SAID, ARABIA.
Just on the Suez Canal, and Caravans in the foreground entering the desert.

THE ALPS.

The Most Extensive of Europe's Mountain Systems—Ancient and Modern Divisions—Some High Peaks.

THE most extensive mountain system in Europe is the Alps. It comprises a part of southeastern France, a part of northern Italy, a part of southern Germany, the western part of Austria-Hungary, and most all of Switzerland. The ancient division of the Alps were the Maritime, Cottian, Graian, Pennine, Rhaetian, Noric, Carnic, Venetian and Julian Alps. It is now divided into Western, Central and Eastern Alps. The western Alps include the Ligurian Alps, Maritime Alps, Cottian Alps, Graian Alps, Montagues des Maures and Esterel Mountains, Mountains of Provence, Alps of Dauphine, Limestone Alps of Savoy, and the mountains of Chablais and Faucigny. The central Alps include the Pennine Alps, Lepontine Alps, Rhaetian Alps, Otzthaler Alps, Bernese Alps, Fribourg Alps, Emmenthal Alps, Urner and Engelberg Alps, Todi range, Schwyzer Alps, St. Gall and Appemzell Alps, Vorarlberg and Allgau Alps, North Tyrolese, and Bavarian Alps, Luganer Alps, Bergamasker Alps, Ortler Alps, Nonsberg Alps, Adamello Mountains, and Tridentine Alps. The eastern Alps include the Zillerthal Alps, Hohe Thuern, Niedere Tauern, Carinthian and Styrian Alps, Styrian Nieder Alps, Kitzbuhler Alps, Salzburg Alps, Upper Austrian Alps, North Styrian Alps, Lower Austrian Alps, Lessinian Alps, Cadoric Alps, Venetian Alps, Carnic Alps, Karawanken, Bacher and Santhaler Alps and Julian Alps.

GALLERY OF THE AXENSTRASSE, SWITZERLAND.

Looking toward Flulen, a natural cavern in the mountain side, much resorted to by tourists.

There are also va-

rious outliers of the system in Hungary and Croatia. The length of the range from the Pass of Giovi, north of Genoa, to Semmering Pass is over 600 miles, and its width is from 90 to 180 miles. Its highest peak is Mont Blanc, 15,781 feet, on the borders of France and Italy; its average height is about 7,700 feet. Its largest glacier is the Aletsch, about thirteen miles long.

BASCULE BRIDGES.

Materials Used in Bridge Construction—The Largest Stone Arch Known—The Bascule Bridge Proper.

BRIDGES are made of various materials, principally stone, iron and wood, and in a great variety of forms. In an arch, or arched bridge, the passage or roadway is carried by arch or arches, which are supported by abutments or by piers. Such bridges are constructed of brick, stone, iron, steel or wood. Brick is seldom used alone, except for comparatively small spans and for unimportant work when stone cannot readily be obtained. In more important work it is often combined with stone, which is introduced to bind, to distribute pressure, to protect the more exposed portions, and for architectural effect. Stone, wherever it can be used, is the most valuable material, on account of its massiveness, stability of form and resistance to the elements. It is, however, inferior to iron in economy, facility of construction and ready adaptability to various situations.

A ROPE BRIDGE OF THE ANDES MOUNTAINS, SOUTH AMERICA.

Held in place by guy ropes and spanning a deep gorge. Constructed by natives

T

Among the finest monuments of antiquity are ranked the remains of Roman arched stone bridges. The largest stone arch known is that of the bridge of the Washington aqueduct over the Cabin John Creek ; span, 220 feet ; rise, 57.25 feet. The first arched bridge built of iron was erected over the River Severn, in England, and consists of five parallel ribs of cast-iron, with a span of 100 and a rise of 40 feet. The Southwark bridge over the Thames at London, the central one of the three arches of which has a span of 240 with a rise of 24 feet, formerly ranked as the largest iron arched bridge ; but this span has since been more than doubled, as notably in the bridge over the Mississippi at St. Louis, and the Washington bridge over the Harlem River in New York.

Arch Beam Bridges.

In an arched beam bridge arched beams in compression constitute the principal members and sustain the load. The beams are sometimes built of parallel layers of planks, which are made to break joint. In the more important constructions the arches are often compound. They have been employed in modern bridges of considerable magnitude. An arched-truss bridge is a form in which the compression member is an arched beam, as in the McCallum truss. In a beam-truss bridge the load is supported by beam-trusses or openwork beams. A compression-cord and a tension-cord are essential, and the stresses are transferred from one to the other on their way to the points of support by means of struts and tension-bars, which together are called web-members.

A bascule bridge is a drawbridge arranged with a counterpoise, so that as the floor of the bridge is raised the counterpoise descends into a pit prepared for it ; the commonest form of medieval drawbridge.

Movable Bridges.

Swing bridges are by far the most commonly employed of movable bridges. The large rivers to be crossed in America have demanded swing bridges of great span, with excellent contrivances for minimizing friction and insuring steadiness when closed. The swing bridge over the Raritan, in New Jersey, allows two free passages, each 216 feet wide. It is what is known as a double swing bridge—the bridge being balanced on a central pivot assisted by a system of rollers—opening and closing the two passages at once, and affording two passages instead of only one, as in the earlier bridges, which were generally made in two leaves to cross single passages. The Kansas City Bridge crosses two passages, each 160 feet wide. The total moving weight is 303 tons. The bridge is opened by steam power in about one minute and a half, or by manual power in two minutes. From two-thirds to three-fourths of the moving weight rests on the central pivot.

Movable bridges, sometimes called telescope bridges, capable of being rolled horizontally backward, or in an oblique direction, are occasionally employed. The bridge across the Arun, near Arundel, is 144 feet long. It is traversed on wheels and acts as a sliding cantilever, the overhanging portion resting on the opposite abutment when in place.

THE SUEZ CANAL.

First Conception of the Canal—Error Made in Calculation—De Lesseps' Undertaking a Success—Cost and Extent of Canal.

THE Suez Canal connects the Mediterranean with the Red Sea. It was the idea of Napoleon the First to build a canal connecting these two seas, but he abandoned it with the report of the engineer Lepere in 1798, who placed the surface of the Red Sea nearly thirty feet higher than that of the Mediterranean In 1841 this error was corrected by British officers, and in 1849 Ferdinand de Lesseps began a thorough investigation of the isthmus.

Obtaining the consent of the Khedive of Egypt and the Porte, he organized the Universal Company of the Maritime Suez Canal in 1856. Half the capital of this company was raised by public subscrip tion in Europe, chiefly in France, the other half was furnished by the Khedive of Egypt. April 25, 1859, work was commenced on the canal, and November 16, 1869, it was opened for navigation. The work of construction cost about $100,000,000. The canal is 100 miles long, traverses Lake Menzaleh, Lake Timsah, and

PORT SAID SHOWING THE SUEZ CANAL.

This canal connects the Mediterranean and Red Seas, is 100 miles in length and cost $100,000,000.

Bitter Lakes, and was originally from 150 to 300 feet wide at the water surface and 72 feet wide at the bottom, with a minimum depth of 26 feet. Since 1886-1890 it has been deepened to 28 feet and considerably widened. In 1875 the British government purchased of the Khedive his shares in the Universal Company of the Maritime Suez Canal.

The following table shows the increase in the number of vessels passing through the canal and the receipts of the company:

Year.	No. of Vessels.	Tonnage.	Receipts.
1870.....	486	654,915	$ 1,031,865
1880	2,026	4,344,519	8,147,885
1890.....	3,389	9,749,129	13,402,180
1894.....	3,352	11,283,855	14,755,365
1895.....	3,434	11,833,637	15,620,745

HISTORY OF AMERICAN FLAG.

Resolutions Adopted by Congress—What Stars and Stripes Mean—First Adoption.

JUNE 14, 1777, Congress in session at Philadelphia, adopted the following resolution:

"Resolved: That the flag of the thirteen United States be thirteen stripes, alternate red and white; that the union be thirteen stars, white in a blue field, representing a new constellation."

The idea of the thirteen stripes was not entirely new, for the Philadelphia Light Horse had used it in the early part of 1775, and at Washington's headquarters at Cambridge, when he took charge of the army, January 2, 1776, there was in use a flag with thirteen stripes just as they are to-day. There is no record, however, of the white stars in a blue field prior to the resolution of June, 1777.

It is not known just to whom credit is due for designing the American standard, but the descendants of Mrs. John Ross, of Philadelphia, assert that she, with the aid of General Washington, first combined the stars and stripes after a design drawn at her suggestion by him. The flag was not officially ordered by the Secretary of State until Sept. 3, 1777, but it is known that the stars and stripes were born by the victorious American army in the Battle of Brandywine, and was ever after carried by the American forces.

The Ranger, commanded by Capt. John Paul Jones, was the first American ship bearing the flag of the Union to receive the salute of a foreign power. The salute was paid by the French, February 14, 1778. April 4, 1818, after a number of new States had come into the Union, Congress passed a law by which, on the admission of every new State, one star was added to the union of the flag.

RAISING OF CHICKENS.

The Business Has Become Profitable—The Incubator and its Wonderful Results—Heating by Hot Water and Hot Air—Winter Care of Fowls.

OF recent years the business of raising chickens and other fowl has assumed proportions throughout the country that bids fair to rival many of the great industries of the agricultural districts. With the modern incubator the work of the poultry farmer has been greatly facilitated, and the art, for such it may be called, is made much more tempting from a financial point of view.

The practice of artificially hatching chickens has been in vogue in Egypt for a couple of centuries. The American inventor, however, has greatly simplified the process. There are two classes of apparatus to-day—one heated by hot water and the other by hot air. The eggs are put on trays and placed in the incubator directly beneath the tank which furnishes the heat. These artificial hens are built double-walled and the intervening space is packed with asbestos to prevent a sudden change in temperature from affecting the inner chamber. The capacity of incubators ranges from 25 eggs to 600, and the manipulators are most successful during the fall and spring, the hot months presenting unprofitable results.

It requires twenty-one days for eggs to hatch, and the temperature is maintained at 103 degrees. After hatching, the chickens are permitted to remain from twenty-four to thirty-six hours in the incubators to dry, and are then transferred to brooders, which hold from 100 to 3,000 chickens. On some farms the chickens are retained in the brooders until ten weeks old. The hatching of chickens is the easiest part. It is the watching necessary to bring the chicks to a marketable age that is the greatest labor.

Real estate is an important factor in poultry farming. Much may be obtained from twenty acres of ground. It is not advisable to put more than one hundred and forty chickens on an acre. This may be divided into four yards with about thirty-five in each yard. Adjoining each should be a scratching-shed, ten by fourteen feet, under which the chickens may exercise. During the winter the floor should be covered with three inches of hay and the grain thrown on this, thus forcing the chickens to exercise in order to get their food. With existing conditions to-day the farmer may get all the eggs from a hen in two years while it formerly took five years. The most experienced managers of chicken farms so feed and condition their poultry that the hens begin laying during the early fall, just at the time that eggs will bring the highest price, and at the end of the second winter they are fattened and sold.

THE STEEL CITY.

Pittsburg, an Important City—Composition of Steel—Methods of Treating the Metal.

PITTSBURG, the city of steel, so called from its iron and steel manufactures, is the second city in the State of Pennsylvania, and situated in Allegheny County, at the junction of the Monongahela and Allegheny rivers. It is the leading city in the United States in iron, steel, copper, brass and glass manufactures. It is an important railroad point, headquarters of a river trade, and exports coal, coke, petroleum, etc.

AN OPEN HEARTH FURNACE USED IN MAKING INGOTS OF STEEL.

The illustration shows a large bucket filled with molten metal being poured into the furnace for reheating or fusing.

Steel has been known from early times, but its origin is not known. It has been in use in India for a long time, and is still manufactured in that country by methods similar to those in use long ago. Steel is a form of iron, not occurring in nature, but manufactured, in which the amount of carbon is intermediate between that in wrought and that in cast iron, and this carbon does not exist in the steel in the form of graphite.

Since steel is intermediate between wrought and cast iron in the amount of carbon which it contains, it may be made either by carburizing the former or decarburizing the latter. Carburization is one of the oldest methods. Though differing in details, in the essentials it is practically the same process by which Indian wootz is manufactured. By this method known in 1722 blister steel is obtained, and this is further worked up into spring, shear and double-shear steel by one or more processes of fagoting, welding and hammering or rolling, the object of this being to give the metal greater homogeneity. A great addition to the value of this process was the invention of Huntsman in 1740, of cast-steel, the product of fusion in crucibles, under suitable manipulation, of blister steel, which process is still in use as first arranged almost without change.

By this method when iron of a sufficiently high grade is used, the finest quality of steel is produced, and it is only steel manufactured in this way which can be used for the best tools, weapons and cutting instruments of all kinds.

The methods of producing steel by the decarburization of pig-iron are numerous and varied. The process known as the "Siemens," the "Martin," and the "Siemans-Martin" are most extensively employed. The steel made by any of these processes is generally called "open-hearth steel," the pig-iron being decarburized in the openhearth regenerative furnace. The most important process is the "Bessemer," invented by Sir Henry Bessemer about 1856, which consists of blowing air through molten pig-iron in a "converter," or vessel lined with a refractory material.

THE OSTRICH IN AMERICA.

They are Raised in California—Three Farms Make a Profit Out of Them—May Be Hitched Like Horses—What Is Done with Chickens—Weight of Grown Bird.

VERY little is known in America about the ostrich, although there are, in this country, three farms on which these birds are raised. Many opinions which have been cherished from childhood about the ostrich are mere fabrications. There is no truth in the synonym frequently used: "Like an ostrich which thinks itself safe because its head is buried in the sand."

The three farms in this country are a source of much profit to the owners and also a great curiosity to visitors. The largest of these farms is located near Pasadena, a few miles from Los Angeles. This is the only farm on which the birds have been imported directly from Africa. The farm was stocked in 1886 with forty-two birds, which were transported from their native land in a ship chartered especially for the occasion. A great many of the birds died en route. This, together with the fact that most of the birds have just started to lay, accounts for the comparatively small output of the farm.

The best feathered birds are usually paired off for breeding purposes and penned in separate corrals, five of which cover an acre. During the laying season these birds are vicious, and the attendants never dare to enter the corrals. Ostriches can strike a powerful downward blow with their feet and have been known to have permanently crippled horses.

After the ostrich hen is three or four years old and when the rainy season is over she begins to lay in a sand hole three

"JUST OUT," NEW BORN OSTRICH CHICKS.

Hatched in the sand by the heat of the sun's rays. Our largest ostrich farm is near Pasadena, Cala.

feet in diameter and one foot deep. To protect the eggs from the sun's heat she covers them with sand, which perhaps has given rise to the sand theory. The male birds do most of the work. They sit on the eggs from 5 o'clock in the afternoon until 9 o'clock in the morning, when they are relieved by the females.

The chicks are taken from the parents as soon as hatched. In this way two sittings a year are obtained,—a system more profitable than that of using an incubator. A pair of birds in their prime raise on an average of ten chicks per year. In some instances thirty-two have been taken from one pair. Ostriches over five months old, except those breeding, run in troops during the day and are corraled during the night to protect them from dogs and coyotes. The full-grown bird weighs 250 pounds, measures over seven feet in height and lives about twenty-seven years.

LARGEST LIZARD KNOWN.

THE remains of what was once the largest lizard known have been found in western Colorado by Curator E. Riggs, of the Field Columbian Museum of Chicago. The thigh bone of a dinosaur which measures 6 feet 10 inches and weighs 500 pounds. It is thought that a lizard with such a thigh bone must have been over 80 feet long and 25 feet in height. This animal lived thousands of years ago, and lived on grass and tree ferns, a true vegetarian. The partial remains of several varieties of the snake family have been recently discovered in the Rocky Mountain region, showing that the climate of this section has very materially changed. For the sustenance of these immense animals it would require thick and perpetual growth now confined to the Tropics. The part of the United States now forming the Rocky Mountain system, then must have been an immense valley filled in with great lakes and immense growths of vegetation. The upheaval resulting in the formation of the Rocky Mountain system has brought within human reach the remains recently found, from the measurements of which can be constructed models, showing size shape and general appearance of the being itself.

LIZARD LARGER THAN A HOUSE.
This lizard was larger than a house. It lived on grass, trees and ferns.

APPIAN WAY.

First Roman Road Constructed as a Public Work—Bordered by Many Tombs and Ruins—Pavement in Good Condition.

THE Appian way, most famous of Ancient Roman highways, extended from Rome to Brindisi, and was probably the first great Roman road undertaken as a public work. In 312 B. C. it was begun by Appius Claudius Caecus, the censor, and carried to Capua. It was next extended to Beneventum, and probably did not reach Brindisi until 244 B. C., when a Roman colony was inaugurated there. At the present time the Appian way, after it leaves Rome, forms one of the most notable memorials of antiquity in or near the Eternal City, bordered by tombs and the ruins of monumental buildings. Long stretches of the pavement remain perfect, and show that the width of the roadway proper was fifteen feet. This highway was the first of many great public highways constructed by the government of Rome immediately after the Romans were successful in their war against the Carthaginians, and had added to their territory Southern Italy. The termination of this war greatly increased the wealth of the Romans. Each free Roman was granted by the Roman Senate either a sum of money or seven jugera of land, as he elected. These newly acquired possessions consisted of public lands, valuable forests, mines, quarries and fisheries. In order to hold her new territory, however, Rome planted the Peninsula thickly with colonies, and connected them with the Capitol by these wonderful and elegantly constructed highways.

APPIAN WAY.

Commenced in 312 B. C. Leading from Rome to Brindisi. It is bordered with Tombs and monumenta ruins. Here the ancient Roman Emperors for centuries drove in their chariots decorated in costly splendor.

THE WONDERFUL ERMACK.

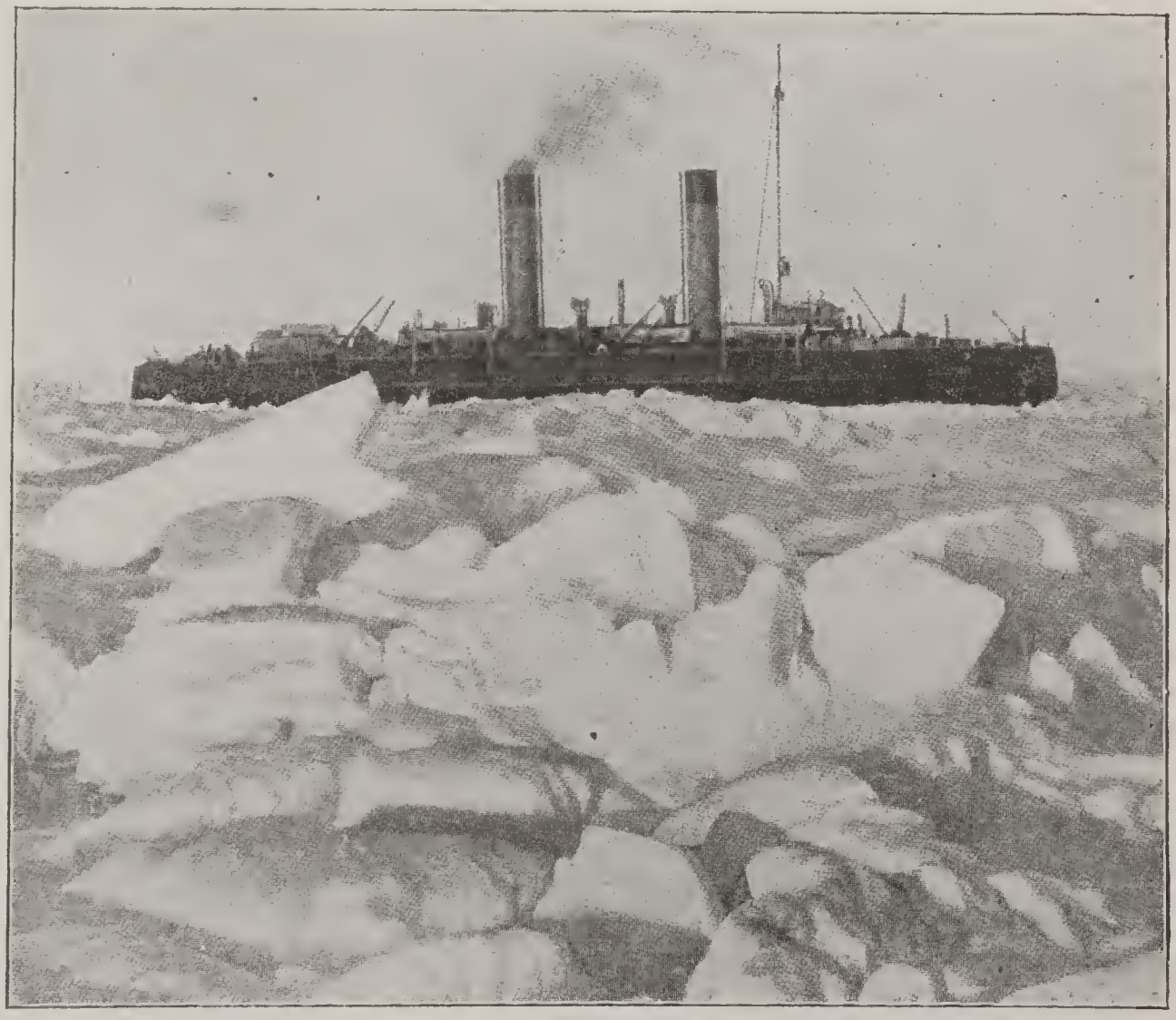
A Russian Vessel of Marvelous Strength—It Is Hoped She Will Yet Force Her Way to the North Pole—Manner of Construction and Method of Opening Arctic Wastes—First Suggested by American Ice Breakers.

FOR the last twenty years inventors have been endeavoring to construct steamships to navigate the Arctic waters. Few if any of these have met with success. The Russians, who have taken a most active part in this work now have a vessel which bids fair to accomplish the feat. It is the ice-breaker "Ermack."

This unique ship was suggested by the ice crushers which ply the waters of the Straits of Mackinac. She is built for neither cargo nor passengers. Instead of having a double bottom, as most vessels are equipped with, the Ermack has a double frame throughout. Steel plates, a quarter of an inch in thickness, form the epidermis, and they extend from the keel to the level of the deck, forty feet above. Within this frame is another. Staunch braces of steel connect the two walls while the space between them is divided into water-tight compartments, varying from ten to three feet in diameter, and extending completely around the vessel.

Two Ships in One.

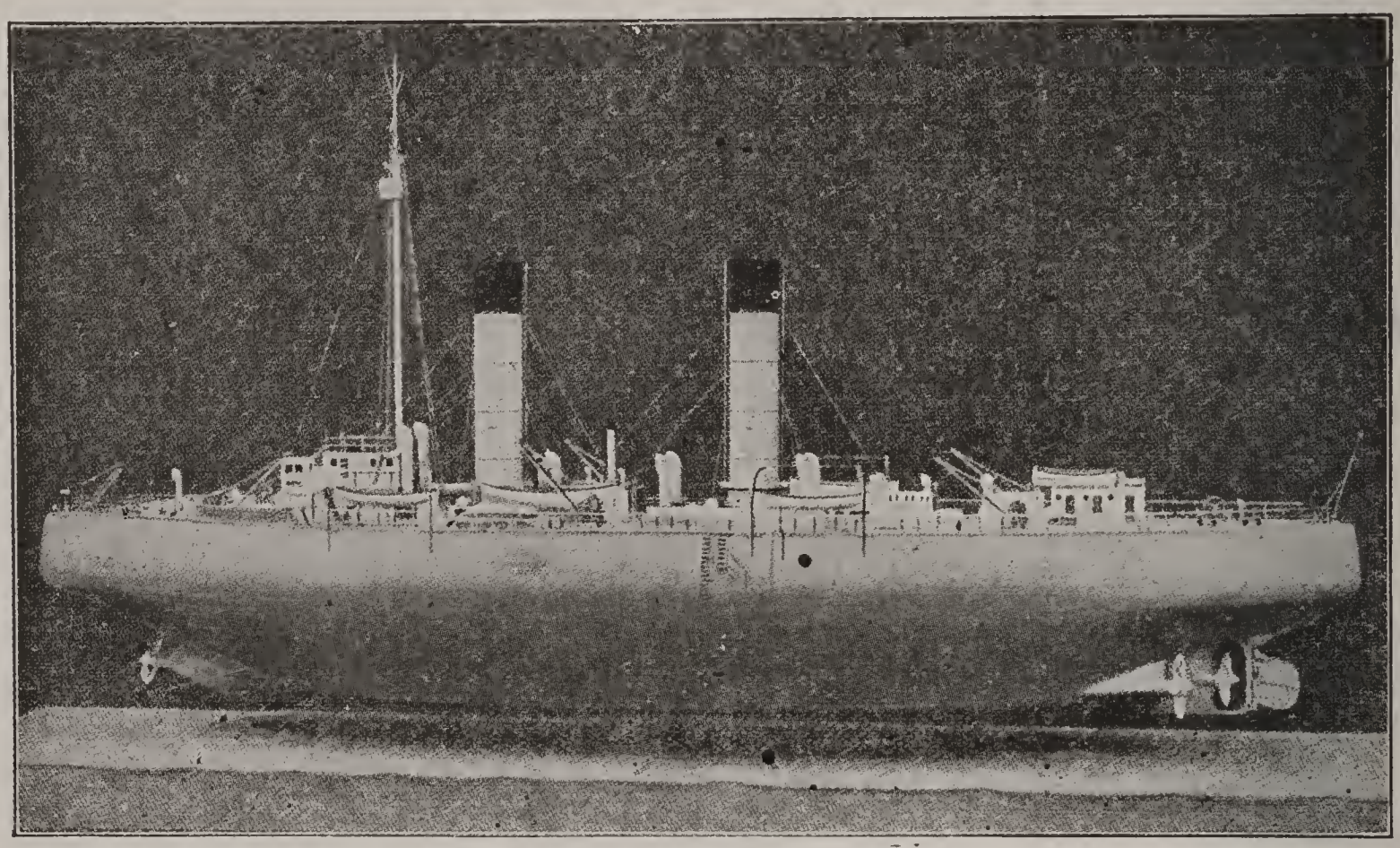
The "Ermack" is virtually two ships in one. Her deck is double, two sets of sky-



THE ERMACK AT WORK IN ARCTIC ICE.

lights are provided, and a wooden partition incloses the cabin, regardless of the fact that the apartment itself is constructed of thick steel plates. The wooden coat is provided more with a view to warmth than durability. Heat is furnished from the ship's boilers through steam pipes which run between the inner walls. The temperature of the "Ermack's" cabin is always comfortable, as the outer air chamber prevents the heat from escaping. The ship is divided into forty-eight water-tight bulkheads, most of which extend to the deck level. After she was built these compartments were filled with water, but the vessel retained her buoyancy as gracefully as before. The provisions for strength and durability take up much room. Of the remaining space the propelling machinery, located amidships, takes up the greater amount.

Power is furnished by four propellers—three aft and one at the bow. They may be operated independently in case of accident, as they are connected with separate engines. The total horse-power of the ship is 10,000—2,500 for each propeller. The forward propeller was adopted from the ice-breakers used on the Great Lakes. The object of this screw is to suck the water from beneath the ice in order to make the resistance less. In loose ice it may be reversed, which forces small blocks of ice from the vessel's course. Cabins, scientific laboratories and quarters for officers and crew occupy the remaining space. Her bunkers carry when filled, 3,000 tons of coal. Altogether the vessel cannot be called large, as her total displacement is but 8,000 tons.



A MODEL OF THE ERMACK.

The most powerful ice crusher in the world. She may yet reach the North Pole.

Peculiar in Appearance.

Her external appearance is as remarkable as her interior arrangement. Sharp lines mark her stern and sides. Her sides, instead of meeting the water at an angle of 45 degrees, project above it, giv

ng her the appearance of being top-heavy. She appears to lie upon the surface, while as a matter of fact she has a draught of twenty-five feet. She is 305 feet long, and has a beam of seventy-one feet, which gives her a very blunt appearance. Her speed is anything but fast. In clear water the "Ermack" can make but fifteen knots an hour, the pace of a heavy battleship. She has the appearance of a stout warship, and if put to the test could render a good account of herself, owing to her strength.

The method of attack pursued by this vessel will seem remarkable to the uninformed. It does not charge the ice barrier directly. Instead it pushes its prow up the edge of the berg. With the engines working to their utmost, the forward part of the vessel ascends the barrier until a pressure of 900 tons is brought to bear upon the ice. If the resistance is still too great, an apparatus for adding 200 more tons of pressure is provided. Great pumps are put to work in the hold of the vessel which force thousands of gallons of water to the compartments forward until the pressure directly over the ice reaches 1,100 tons. These same pumps can force the water to different parts of the ship in case a quick move is desired to avoid accident. At times the vessel climbs the edge of the ice until more than ten feet of that part usually below the water-line is visible. Then, unless the ice be solid, the formation gives away. In this manner the craft proceeds and fairly crunches its way through ice fields that would prove absolutely impossible for ordinary vessels to penetrate. This idea of crushing the ice is not entirely new, as it is in vogue on the River Volga, the North Sea and the Great Lakes.

Mate of the Locomotive.

The birthplace of this wonder is also remarkable for the home of the first locomotive—Newcastle-upon-Tyne. She was wrought out at the yards of Sir G. W. Armstrong. When she braced the waves on her initial voyage she was named "Ermack" after the Cossack warrior who conquered Siberia. The primary object of the construction of the "Ermack" was not to aid the cause of Arctic exploration, but to open up the vast region in that vicinity to civilization and Russian capital. Russia has the longest coastline of any country in the world, but for many months in the year its ports are impassable owing to the ice. The government recognized the great loss incurred by the ice, and set about remedying the evil. The "Ermack" was the result. She was completed in February, 1900. Kronstadt was named as the destination of her first voyage. It seemed ridiculous to make the trial, but as the vessel slowly poked its nose into the harbor of that city the entire population stood on the shore and welcomed its arrival. Thus did the "Ermack" practically display its ability. Thirty ice-bound merchant vessels were freed on this trip and escorted to the harbor, one in a sinking condition.

Her next trip was in the ice fields farther north. Owing to the great depth of the ice her forward propeller was removed, as it proved a hindrance. The trip was regarded, however, as entirely successful, and a number of scientists returned from the cruise with much valuable information.

POMPEII.

An Ancient City of Beautiful Dwellings—Lack of Magnificent Civic Buildings—Some of Its Buildings.

THE ancient city of Pompeii was situated on the Bay of Naples, Italy, thirteen miles southeast of Naples, and nearly at the foot of Mount Vesuvius. It was a flourishing provincial town where many Romans lived. In 63 A. D. an earthquake severely injured the town, and in 79 an eruption of Vesuvius completely destroyed it. The site was discovered in 1748, and excavations made

The buildings of Pompeii were modest, and its private dwellings handsome. Many antique sculptures and utensils have been excavated from the ruins. Among some of the more important and imposing structures found are the great theater, of the time of Augustus, semicircular in plan, with a diameter of 322 feet. The cavea has two precinctions: Below the lower one there are four tiers or seats of honor; the upper one has communication by passages and stairs with the triangular forum, and above it there are raised tiers of seats for

METHODS USED IN BUILDING THE PYRAMIDS, ANCIENT EGYPT.

Upon whose work 100,000 men, women and children were engaged for years.

women and a platform for wo king the awnings.

The Temple of Isis is a small tetrastyle prostyle structure raised on a basement in a peristyle court upon which open the lodgings of the priests. The house of

room and dining room. The house of Meleager is noted for its paintings and decorations. The house of Pansa is one of the largest and most elaborate dwellings of Pompeii. It measures 120 by 300 feet. The house of Sallust is a large

UNCOVERED RUINS OF THE ANCIENT CITY OF POMPEII.

Which was overwhelmed by the eruption of Mt. Vesuvius, 79 A. D. Archaeologists are still working in the ruins.

Castor and Pollux is a double house with a large peristyle court common to the two parts. The exterior of the house is finished with stucco decoration in panels and arabesques. The house of Marcus Lucretius is a double house of three stories. It has a beautiful reception

and richly decorated mansion, similar in arrangement to the house of Pansa. The house of Faun is considered to be the best in style of the ancient city. The wall paintings are replaced by Mosaics. The famous Dancing Faun and the mosaic of the Battle of Issus,

in the Naples Museum, came from this house.

The ruins of Pompeii have furnished us the best information we have on the material civilization of Rome. Excavations were commenced between 1808 and 1815, and have been continued since that time.

Five hundred years prior to the destruction of Pompeii by the ashes and lava from Vesuvius, and probably at a time when Pompeii was the Metropolis of Southern Europe, there existed in Southern Asia the flourishing city of Babylon. From here Nebuchadnezzar ruled Babylonia during the most illustrious period in the history of that country. He built canals, reservoirs, irrigating sluices, harbors on the Persian Gulf, and made Babylon the most magnificent city of Asia

In order to gratify his queen, Amyitis, who pined for the mountains of her native Media, he built the celebrated Hanging Gardens of Babylon, which consisted of terraces built on arches raised high above the city. Earth was laid on this structure and planted with trees and shrubbery On the highest levels were fountains and cascades which nourished the plants. Art strove to emulate Nature, and the lofty rocks and various trees of this wonderful Paradise were a pleasant change from the monotony of the Babylonian plain, and served to remind the Babylonian Queen of her husband's love, and the beauty of her native country.

ONE OF THE SEVEN WONDERS OF THE WORLD.

The Hanging Gardens of Babylon, near the Tower of Babel. Time has destroyed this wonder. It is estimated they cost $10,000,000 to build.

MODERN FIRE FIGHTING.

New York Training School—How Drilled—Salaries Paid—Modern Appliances—Private Companies, How Organized and Equipped.

THE largest fire the world has ever known occurred in Chicago, October 9, 1871. The loss was 200 lives and $290,000,000 of property. Since the days of volunteer fire companies, when young men were ready to exchange evening dress for the helmet and rubber coat of the fire fighter, there have been many developments in the methods and means of combating fires. The old hand-pump engine has been relegated to history, and in its stead the steam engine belches forth its watery protest to the flames. It is not improbable that even this complicated monster of fire and water may soon disappear.

In the place of the volunteer now stands the professional, who undergoes a thorough training before he is admitted to service. The Firemen's Training School, of New York, from which 40,000 men have been graduated in the past sixteen years, occupies handsome quarters erected and equipped at a cost of more than half a million dollars. There men are drilled in the mysteries of the guild. First comes instruction in handling the scaling ladder, and adroitness in passing from window-sill to window-sill, and knowledge of this is regarded as highly essential and valuable in the service.

Then the men are taught to handle the life line. A light rope is shot to the roof, where it is seized and a heavy line drawn up by means of it and made fast. Each man is provided with a life belt, in the front of which is a "snap." A few turns of the line about this attachment relieves the fireman of all but about five pounds of pressure, so that an easy descent is possible. When the man is bringing down a helpless body or additional weight, two additional turns are necessary.

Last Stage of Drill.

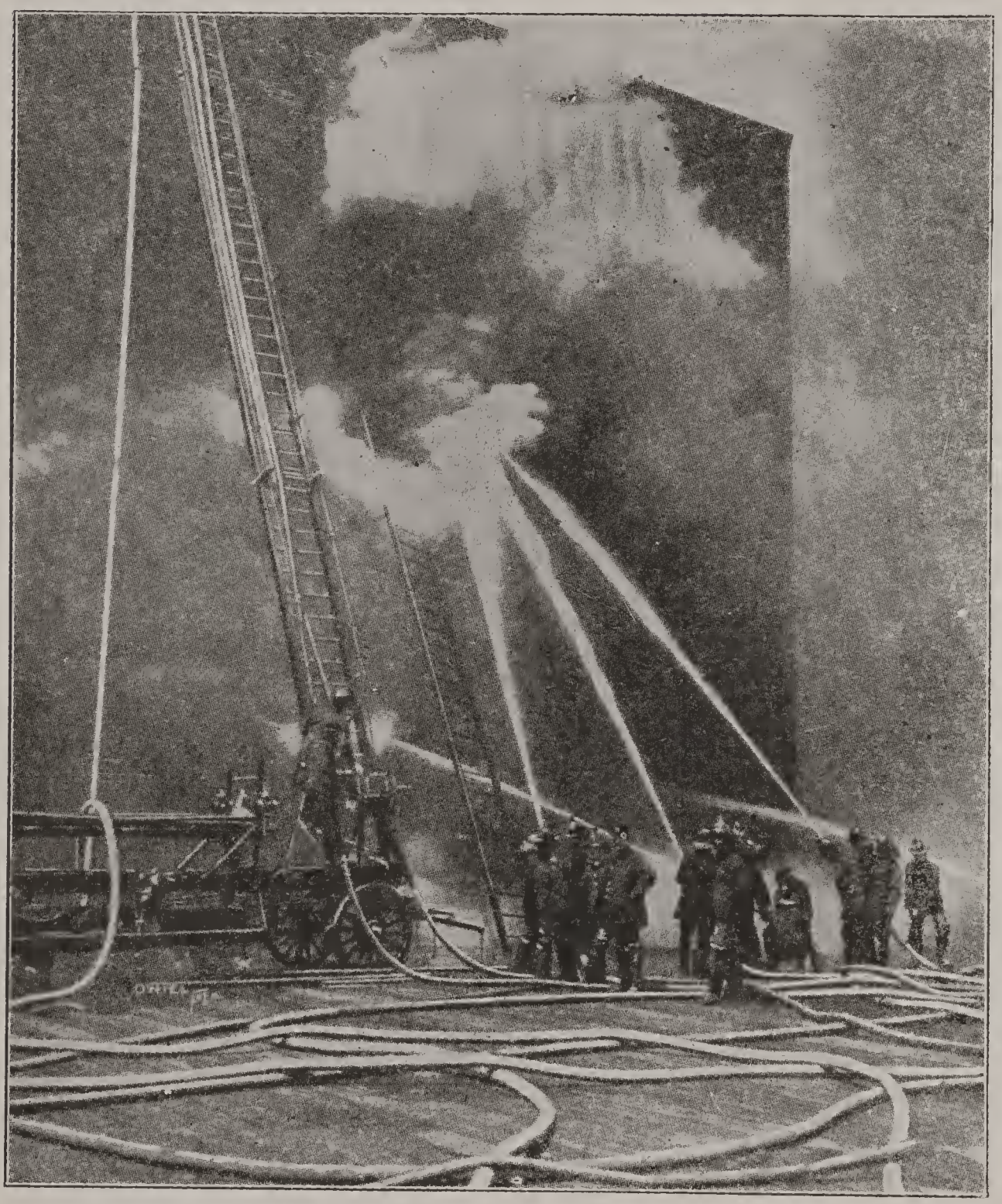
The final step is taken when the men are thoroughly drilled in the manipulation of the life net. A tinge of realism is given this practice by precipitating bags of sand, weighing from 75 to 100 pounds, into the net from an elevation which would correspond to a three or four-story window. When the men have become sufficiently proficient, they are enrolled in the service and the serious work of the fireman begins.

The first three years the salary is $1,000 per year, and thereafter $1,400. The annual compensation of the officers is:

Chief	$5,000
Department Chief	4,300
Chief of Battalion	3,300
Captain	2,160
Lieutenant	1,800
Engineer	1,600

After twenty years of service, retire-

ment on half pay may be allowed; and in case of death while on duty, $1,000 and a pension of $25 per month goes to the nearest kin. As a class the firemen are superior physically to the policemen. In addition to regular municipal departments many



MODERN FIREMEN FIGHTING A BLAZE IN A GRAIN ELEVATOR.

Note the huge streams of water.

mills and factories are equipped with hose, ladders, hydrants at convenient intervals, and other modern apparatus. Their employés are organized into hose and ladder companies, engineers, etc. Such private organizations are suggested, encouraged and required by some insurance companies and add to the security of property. Some insurance concerns supply a pamphlet of tactics for the instruction of private organizations.

There are two simple contrivances, the product of modern ingenuity—simple things are the most difficult to create—which, if used promptly, afford almost absolute immunity from danger, either to life or to property.

The Fire Extinguisher.

The first is a fire extinguisher. It consists of a small bottle of acid sealed with mica and containing a rubber-covered lead ball. This bottle is within a larger one, holding, in addition, four gallons of water in which soda is held in solution. The whole apparatus is enclosed in a metal case and fitted with a hose. At alarm it is inverted, the ball breaks through the mica, and the released acid, coming into contact with the soda and water, generates gas, which discharges a stream of fluid about fifty feet.

At a test made in New York, one of these machines extinguished in 59 seconds a fire in a pile of pine boards and barrels which had been saturated with kerosene and allowed to burn until some of the timber was charred. Such a device would

have prevented the New York Windsor Hotel fire, and the loss of forty-six lives. The second contrivance is a simple strip of canvas which is bound on the edges with rope and can be rolled up and fastened at the window-sill. When fire breaks out these rolls are cast out the window, the sympathetic crowd seizes the lower end, makes it fast across the street, and in the improvised chute the building's occupants slide to safety.

Until recently, many students of the fire problem have maintained that our modern sky-scrapers should be abbreviated and brought within range of the engine, which cannot force a stream higher than nine or ten stories, but a New York engineer maintains that the fault lies with present methods of fire-fighting, and not with the height of the buildings. If properly equipped, he says, the sky-scraper could be made a protection, not only to itself, but also to surrounding structures. A row of sky scrapers would have prevented the spread of the flames which devoured Chicago three decades ago. New York has finer natural facilities for an effective fire system than any city in the world. Surrounded on three sides by water—salt water at that—and all parts of the city easily accessible, an almost perfect system might be established.

"Control," the Watchword.

"Control" is the watchword of the fire fighters of to-day. To confine the flames to the point of origin rather than merely to extinguish them is recognized to be necessary. Direct attack of the origin of the fire would frequently be futile, and not only would it be impossible to extinguish the flames at that point, but attention there would allow them to spread.

The fire losses paid by insurance companies, each having over $1,000,000 assets during the year of 1898 amounted to $56,000,000. The largest and finest fire department in the world is owned by the city of Chicago. Since 1871 its equipment and maintenance has cost the city $50,000,000. The city maintains ninety steam fire engines, all of which can be used at one fire. Chief Swenie, of the Chicago department, is ranked as the "first fire fighter" in the world. He has been in the Chicago department fifty-one years.

SPECULATIVE HAND SIGNS.

How Brokers Buy and Sell Grain and Stocks—Expressive Use of the Fingers and Hands—Code of Honor that Governs all Traders.

MILLIONS of dollars change hands daily in Wall Street and the other great money markets of the world without the scratch of a pen. The trading is carried on with signs made by the hands and fingers. It is generally recognized that men must be scrupulously honest in these dealings, more honest, in fact, than in almost any other business. The reputations and the opportunity to be disgraced are so great that many rules are in use which would seem curious anywhere but on the floor of the exchange. Visitors to these exchanges during a busy session imagine that the brokers and every one on the floor are crazy, but through all that excitement the greatest order and system prevail.

The noise at these sessions is so great that men are unable to hear one another talk even when speaking directly into the ear. Megaphones cannot be used, as this would make matters worse. In order to make sales with a customer standing a few feet away the broker has a code of signals or signs which he makes with his fingers and hands like a deaf and dumb person. In this way millions of dollars worth of stock are bought and sold daily throughout the world.

How it is Done.

The hand vocabulary enables a man to bid or make offers on a stock and announce the number of shares and an exact fractional price more quickly than he could speak. A single finger of either hand held horizontally signifies ten shares of stock or 1,000 bushels of wheat. Two fingers together mean twenty shares or 2,000 bushels of wheat, and so on. Fifty shares is signified by an "O," made by the thumb and first finger. One hundred shares or 100,000 bushels of wheat

THE SIGN LANGUAGE.

Used by members of a Board of Trade in buying and selling grain and shares of stock.

are signified by a closed hand. When a broker wishes to buy wheat or stocks he lets his fellow brokers know by extending his hand partially open, and drawing it slowly to him. When anxious to sell he pushes his open hand from him. The names of stocks are not told by signs, but the brokers gather about blackboards on a seat overlooking the floor, but these precautions are rarely needed. A thousand disputes which it would seem must inevitably end in a free-for-all fight arise each day and quickly subside.

It sometimes happens that two men will misunderstand each other in quoting a price, and that after the sale is made each

DULUTH BOARD OF TRADE AND THE TRADERS IN THE WHEAT PIT.

which bear the names of the stocks being sold.

The rules of the exchange governing all such transactions are very rigid, yet it is surprising the large number of disputes arising every day. A committee of a half dozen or more men are constantly patrolling the floor to enforce the rules. A man with authority to decide disputes also sits will have a different quotation in his mind. The disposition of these cases is curious. The disputants immediately go before the presiding officer and state the trouble. The friends of both parties immediately crowd around the judge. The officer in charge then calls for a vote of hands on the dispute, and the majority rules.

RUBBER MANUFACTURE.

Adhesive Nature and Process of Treatment—Manufactured Articles Made by Compression—How Rubber is Vulcanized.

IT has been but two centuries since rubber was known only as a curiosity; now it is used by all in everyday life, and has added greatly to the possibilities of the industrial arts.

The process by which crude rubber is treated to bring it to useable shape are simple and consist mostly of kneading by steam rollers. The first operation is the softening by throwing it into hot water tanks. Here it stays some hours and is then removed and cut into chunks and thrown into "washers," which are heavy machines with steel corrugated rollers.

This serves to crush and mangle the rubber as it passes through and also removes impurities by means of small streams of water playing down upon the washer. Sometimes the rubber contains a curious impurity in the shape of big brown rubber bugs, which are able to live in the recesses of the rubber without food and with little air.

Rubber Is Adhesive.

So adhesive is the nature of rubber that in a little while the washer has transformed the chunks into a continuous sticky mass. These sheets are allowed to dry and then are crushed again between heavier rolls. Next the rubber is run through the mixers, which are hollow steel rolls fitted on the inside with steam and water pipes to heat or cool in the operation of mixing. Here the rubber rolls through and through and adheres to one of the rolls like a blanket. This is cut off from time to time by the operator, who cuts with one hand, making the incision diagonal from side to side and rolls it up in a big bundle with the other hand and throws it back again for another kneading. A great amount of power is needed for this mixing, owing to the sticky property of the raw rubber. After the proper amount of kneading a compound is thrown in with the rubber that colors it the proper tint and gives it the particular qualities it needs for its destined work.

After the compounding the rubber material is run through calenders, or four polished steel rolls one above the other, which gives it the required thickness. The calenders are also used for crushing the rubber into cotton duck for making rubber cloth, etc.

All manufactured rubber articles are made by compression, not by melting, and pouring into molds, as some think. The great process of vulcanizing rubber, discovered by Charles Goodyear, may be described as a method to effect a chemical change in the rubber whereby the sticky and elastic qualities are removed by the application of heat (usually by steam) and giving durability and other wearing qualities. Hydraulic presses are used with steam connections suitable for the several kinds of rubber goods to be made, and pressure of about 2,000 pounds generally being exerted under heat to vulcanize.

RUBBER TREE IN U. S. BARRACKS, KEY WEST, FLORIDA, OVER 100 YEARS OLD.

Vulcanizing Rubber.

In vulcanizing rubber belts a stretcher is used to remove the stretch in the belts when they are being vulcanized. This consists of a heavy set of clamps with two hydraulic rams at 2,000 pounds pressure per square inch. In the manufacture of rubber belting the cotton duck which has had rubber pressed into it through the calenders, is laid out on long tables and cut into strips of the width the belt is to be. The strips are laid one over the other to the required thickness, and a thin sheet of pure rubber wrapped about the several ply. The belt is then rolled up and finished by vulcanizing in a steam press.

Rubber hose is first slipped in rubber tube form over an iron mandril. Then it is wrapped with duck stripping its desired thickness, and outside this is rolled a thin sheet of rubber. This is covered with

strips and sent to the vulcanizer. The vulcanizer for this work consists of a wrought iron pipe which can be closed at the ends and admits of steam for heating to the proper temperature. Compressed air is blown between the pipe and hose to remove the latter when the process is completed. Cotton covered rubber hose, such as is used by firemen, is made by drawing the rubber tube with the woven hose and then the whole is blown full of steam.

DARING SEAL HUNTERS.

The Seal Has Been a Mischief Maker—Outlaws of the Sea Who Defy England and America—Laws Against Pelagic Hunters—Hunting the Sleepers and Defying Death.

SEAL has been a word synonymous with trouble to the United States and Great Britain since 1886, and to the former for even a longer period. The seal has been an unconscious mischief maker. When the United States paid $7,200,000 to Russia for the territory of Alaska in 1867 it was with no conception of the trouble that land held for the future. The first act of the government was to place the new district under control of the treasury department, and to enact laws prohibiting the slaughter of mink, martin or fur seal.

The Pribilof Islands of St. Paul and St. George, the breeding place of the seal, were eagerly sought after as the happy hunting grounds of the sealers, and to the Alaska Commission Company this part of the new territory was leased for a consideration of $60,000 per annum and a royalty of $2 for every seal taken by the lessees. The company was limited to 100,000 seals per year. This was regarded as an equitable agreement, and doubtless the treasury officials thought themselves very clever to have arranged matters so comfortably, but here a new and unknown element arose.

The Pacific slope began to attract the ambitious youth and others of the east, and as the region west of the Rockies began to teem with new activity and life, complications entered into the seal question. Pelagic sealing (sealing in the deep ocean) began, and soon the herds were so diminished that the Treasury officialdom was greatly alarmed. No drastic measures were employed, however, until 1886, when the United States revenue cutter Corwin was dispatched to arrest all violators of the law.

Three British schooners were seized, their skins confiscated, the boats condemned and the owners fined. Immediately arose a great uproar from Great Britain. It was demanded that the queen's subjects be instantly released. By order of the President this was done. But the Treasury department sent the cutter Rush in the following year, and a similar procedure followed.

The Bill of 1889.

The advent of 1889 brought with it a

bill for the better protection of the seal, and it was proposed to arbitrate the differences between the British and their American cousins. The bill passed Congress and the arbitration scheme was practically adopted. By this time, however, the season of 1891 was approaching. It was impossible to complete arrangements for arbitration and yet it was imperative that measures be taken to suppress the pelagic poachers before they resumed operations. Accordingly a modus vivendi was negotiated in which both Great Brit-

A SPERM WHALE.

Stranded by the tide and unable to float itself, subsequently killed and cut up for its oil and bone.

ain and the United States agreed to seize all violators of the existing law.

The High Joint Commission was appointed and met in Paris, February 23, 1893. It consisted of two arbiters from the United States, two from Canada, one from France, one each from Italy and Norway and Sweden. The case of the United States, presented by its counsel, filled six large printed volumes, and that of Great Britain filled eight equally large volumes. After the necessarily long deliberations of the tribunal, it handed down decisions which were rather favorable—all things considered—to the United States. Furthermore, it formulated a code of regulations which were to continue in force until either of the parties violated their terms. These regulations prohibited the killing (except by Indians) of seal within sixty miles of the Pribilof Islands at any time, and nowhere in the North Pacific from May 1st to July 31st. This close season of three months gives the seals an opportunity for safe passage to the Pribilof Islands from their winter quarters across the ocean. Besides this, the use of fire arms (except shot guns), nets or explosives were forbidden.

Other Provisions.

Pelagic sealing could be prosecuted outside the sixty-mile limit from August 1 to May 1. These regulations still govern sealing operations. Such rules, even, have not succeeded in protecting the herds. Nothing but a law which will absolutely prohibit pelagic sealing for a period of years, and thus allow the herds to restore themselves, will prevent their utter extinction. The Anglo-American Joint Commission, which considers all differences between the United States and Canada, weighed this question in 1897, but although the United States strongly urged the adoption of such a law, the Canadians absolutely refused to consent.

In the same year Congress passed a bill prohibiting sealing except by the North American Commercial Company on the Pribilof Islands, and demanded papers bearing a complete record of every skin applying for entrance at our ports. This was a blow to the Canadian interests, and was designed to force them to agree to the temporary suppression of pelagic sealing.

The pelagic or sea hunters carry on their operations from schooners which, during the stormy season, sail from our shores direct to Yokohama. This circumnavigates the disturbances and thence

they bear toward the sealing grounds. The schooner sails swiftly along and suddenly the shrill cry, "Sleepers" comes from the watch. The boat is lowered and provided with compass, water and provisions for five days, a shot gun and a hundred shells,—then the hunters start.

Fifty yards away the seal is plainly discernible. He is asleep on his back with his flippers across his belly. The oars are taken in and stealthily the steersman shoves the boat toward the quarry. All hands are silent as the tomb, for although his eyesight is poor, the seal has a keen scent and acute hearing. He is approached from the leeward. Silently the boat diminishes the distance until, at fifteen yards, the gun flashes and the prize is won.

The boats are often out several days together, and in rough weather it is no mean achievement to land the seal with both boat and quarry tossing violently. At the Pribilof Islands the government has built fences to confine the bulls during the breeding season, and, where the ground is flat and smooth, boulders and rocks have been provided to protect the pups while the bulls engage in their perennial battles. The catch for the past few years has been:

Land Catch.		Pelagic Catch.	
1896	28,964	1894	61,838
1897	20,890	1895	56,291
1898	18,032	1896	43,917
1899	18,050	1897	24,322
		1898	21,200
		1899	19,512

ELECTRIC STREET RAILWAYS.

Popularity of Electricity as a Power—Guards Against Accidents—Franchises, Duration and Compensation—Detroit's Great Fight.

ELECTRICITY as a means of propulsion for street railways has grown in such favor that cars so operated in the United States are now in the majority. Of the 1,121 street railways in operation in 1899, 966 were electric and the remaining 155 as follows: horse, 103; steam, 31; cable, 21. It is expected that cable roads will disappear entirely, likewise all but the short and unimportant horse lines.

About one-fourth of all the horse-car lines in the country are in New York state and these lines represent about one-third of the mileage and a great majority of the horses in use. The greater number of these horse lines are in the suburbs of New York City, and it is expected that these will give way to electricity.

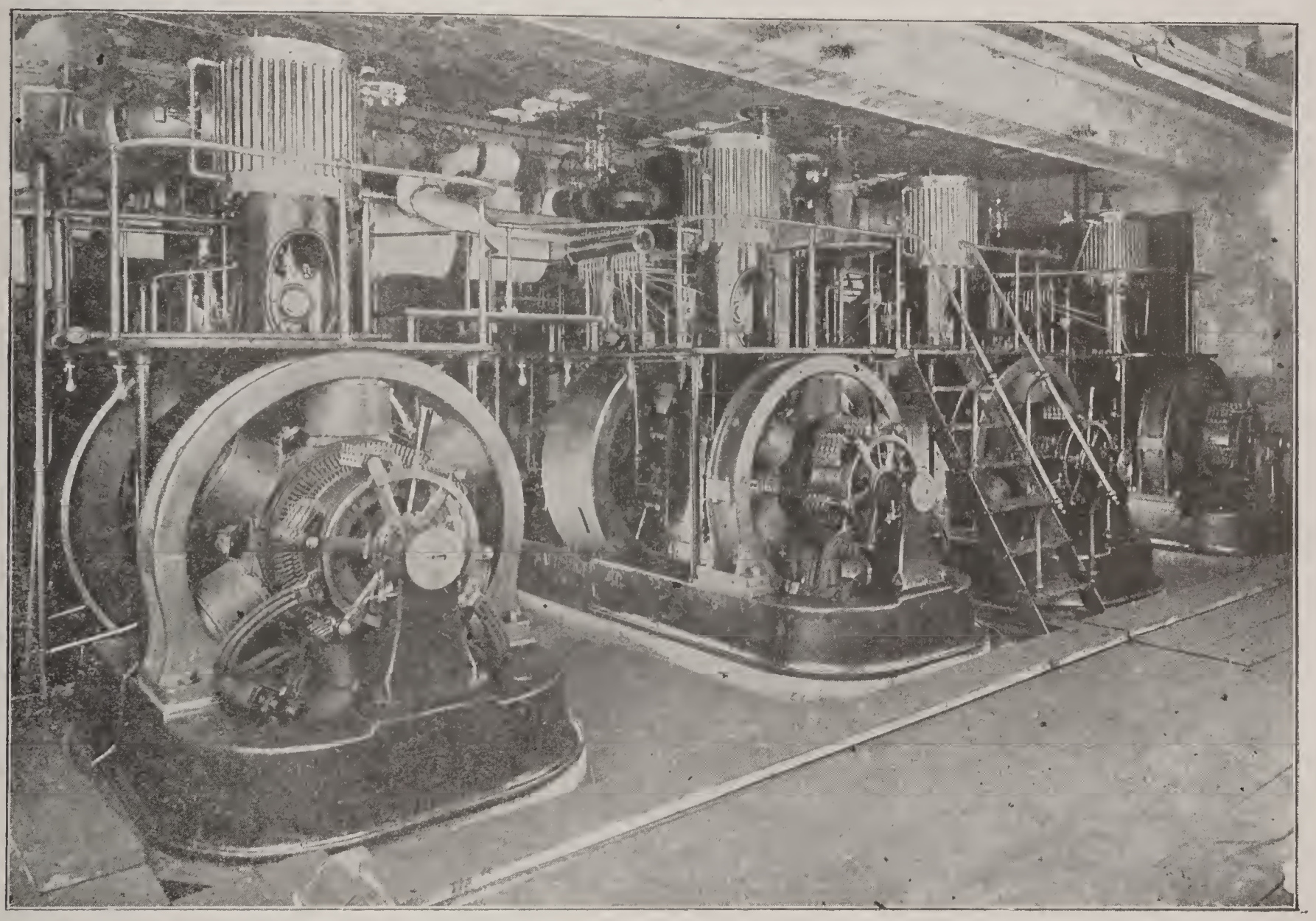
In place of steam many of the elevated roads use the third-rail electric system. The street railways of the United States are capitalized at about $1,600,000,000. In nearly all the country outside Washington and New York cities, the overhead electric trolley system has gained a strong foothold. In New York the open slot underground system has pushed rapidly to the front, and in Washington nearly all the lines are so equipped. In Europe the overhead trol-

ley system continues to be the one generally employed.

Roadbeds are Improving.

Many improvements have been made in the line of road-bed construction in the last few years. Permanence and stability have been insured by cast-welded joints and electrical welds. Some roads have tried concrete beams and blocks for the wooden ties. An attempt to bond rail joints has been made with a view to returning waste current to the power houses by the rails instead of by gas and water mains, and thus save the latter pipes from being destroyed by electrolysis or disintegration by electric current.

In 1898, in Lowell, Mass., an automatic block system for single-track electric roads was installed to aid cars in passing from an opposite direction without collision. The line was divided into blocks, each of which was connected with an automatic cut-off, so that when a car entered that block the current was cut off until it left that block. Then the current was turned on again automatically. Thus two cars could not come into the same block from opposite directions and collide.



POWER HOUSE OF AN ELECTRIC STREET RAILWAY.
Showing the powerful dynamos used to generate the electric current.

There have been many accidents on electrically operated lines. One of the worst, in 1899, was in Bridgeport, Conn., on August 6, when twenty-nine persons were killed and many more seriously injured by the fall of a car from a high trestle. The car jumped the track as it was going upon the bridge and bumped

along the ties for eighty feet, then leaving the bridge, turned upside down and crashed to the bottom. The heavy motors on the bottom of the car broke through the floor and crushed the passengers beneath. Many of the cars are equipped with power brakes operated by electricity and air, decreasing the liability of accident.

Largest Power Plant.

The largest power plant for a railway in the world is that for the Third Avenue Railroad Company, at 216th Street and 9th Avenue, New York City. It is equipped with sixteen engines of the vertical, cross-compound condensing pattern, having generators mounted on the shafting between the cylinders. Each engine has a normal horse power of 4,500, making a total of 72,000 horse power on the average, which can be developed on an emergency to 100,000 horse power. Sixty boilers of 200 pounds pressure each are stoked by machinery from boats to the furnaces, and are emptied of ashes in a similar manner. The chimneys are 200 feet above the floor of the boiler-room and consist of four stacks, which are made of brick for the first 102 feet and of riveted steel courses for 98 feet. The steel part is self-supporting, 12⅔ feet in diameter and lined with brick. The ordinary chimney draught is supplemented by eight exhaust fans. There are sixteen generators of electricity in the plant, one for each engine, and the current is led into the railway lines from five or more transformer sub-stations.

Detroit's Fight for Ownership.

In 1899 a struggle for municipal control of the street railways of Detroit attracted considerable attention. The movement was defeated by a court decision to the effect that the state constitution prohibited the use of State funds for internal improvements in Michigan, and that it was illegal for a city to construct street railways, since the legislature could not authorize a city to do what the state itself was not allowed to do.

The franchise question—the right to use the public streets for a certain period of time is agitating the cities and street railway companies of the United States. The question of compensation to the public is involved with the franchise question.

The following is a comparative table of length of street-railroad and other franchises in Chicago and the principal American cities:

	Years.
Elevated railroads in Chicago	50
Steam railroads in Chicago	perpetual
Gas companies	perpetual
Telegraph companies in Chicago	perpetual
Street railroads in New York	999
Street railroads in Boston	perpetual
Street railroads in Philadelphia	999
Street railroads in Washington	99
Street railroads in St. Louis	45 and 50
Street railroads in San Francisco	99
Street railroads in Kansas City	50
Tribune's school lease	99
Record's school lease	99
Trust newspapers' tubes in downtown streets (Medill & Co.)	50
Asked by street railways in Chicago	50

Rates of Compensation.

Comparative table of the highest rates of compensation paid to the municipalities by the street railroad companies in various cities of the United States:

	Per cent gross receipts.
New York	3
Boston	4.5
Philadelphia	nothing
St. Louis	2
Washington	4
San Francisco	5.15
Kansas City	2.5
Chicago (at present)	10

An approximate idea of what it costs to build an electric street railway is given in the following figures on the Detroit system prepared by Prof. Edward W. Bemis:

175.95 miles of track	$4,350,183
Overhead trolley	760,939
One power house	440,894
One power house	366,249
One repair shop	8,003
Tools and supplies	75,990
Rolling stock	1,102,212
Car houses and land	523,248
All other buildings	179.016
Total (cents omitted)	$7,806,737

THE MODERN DRAMA.

How a Play is Staged—Actors and Actresses Preparing for Rehearsal—Difficult Learning of Parts—The Stage Director's Duties—How the Stage Carpenter Works—Real Cannon Brought Into Service—Powder and Wigs.

LITTLE is thought by the average theater goer of what transpires between the conception of the piece by the playwright, and its first presentation on the stage. Rehearsals, scenic workmanship, the manufacture of wigs, costumes and properties are scarcely thought of as the attention is absorbed in the interest of the play. It is, therefore, interesting to observe what are the preliminaries to the final production of the piece.

The first step is the reading of the play. Those who are to take part are assembled in some suitable room, and the piece is read aloud. The author is invited, by courtesy, to do this, but he usually excuses himself and the dramatic director delivers it. Thus the actors and actresses get the general setting, their relation to the others, the plot, etc. Each actor receives a typewritten copy of his or her part with the "cues," but not a copy of the entire play; the "cues" are the last few lines of the speech by the preceding actor. It is important to memorize these fragments as carefully as the part itself, for mistakes at these points would result in disastrous confusion.

The first rehearsals are gone through in ordinary clothes. The position of balconies, doorways, winding paths, bridges or floral bowers are indicated by chairs and other makeshifts. To begin, the parts are not committed to memory at once. The action of the first act is learned and the location of the actors on the stage thoroughly understood. The actors read their lines with no attempt at expression. The same afternoon the second act is gone through in the same way.

Learning Their Parts.

When these preliminaries are completed the director announces:

"Ten o'clock to-morrow morning—first act rough perfect without parts."

This means that the performers will be expected to be able to repeat their lines without manuscript on the morrow. All are not able to do this, and on the third day, if still imperfect, are severely reprimanded. By the end of the first week most of the actors have learned all that the author has set down for them to do—

action and language. The director then calls for rehearsal "letter perfect," which means that every one must be able to recite his part with absolute correctness —to the smallest word. Of course, this is frequently not accomplished, and that necessitates a "rehearsal for lines," when the performers sit in chairs and repeat simply the words of their parts with no attempt at action.

By the conclusion of the second week everything is committed thoroughly to memory. Actors never receive wages while rehearsing. The stage director is the autocrat of the theater, and his word is the law to which the players must submit. Were this not so, the actors, each striving for individual achievement rather than for the general effect, would radically upset the balance of the piece and the composure of the author. Especial pains are taken in the rehearsal of love scenes and such situations where the action plays such an important part in depicting the sway of the emotions. Here again the director is dictator; if the lover is not ardent enough, he, himself, places the hand where it should be. Most of the kisses given on the stage nowadays are real, but this is not rehearsed excepting once or twice, to be sure the effect will be just right.

The Stage Director.

The stage director is usually a gentleman, though some are boors, and deals with ladies and gentlemen. He is frequently a dramatic scholar and must possess a fine quality of dramatic instinct. He must know aside from precedent and rule whether that action is "the thing." When action and lines are "letter perfect" the "rehearsal with props" is the next step; that is the dress rehearsal with scenery, properties, etc., in proper position, just as it is to be the opening night. The director, the author and the manager constitute the audience and criticise and make changes. If there are any choruses, ballets or musical numbers these have been rehearsed, perfected, separately, and are now brought in in proper order. This is true also of the "off effects," which are the yelling of crowds, the raging of storms and other noises from behind the scenes.

TWO SOUBRETTES READY TO GO ON FOR THEIR ACT

Meanwhile the scenic artist is at work. He proceeds according to written instructions of the author and makes a water-color sketch of each scene. If actual places are to be reproduced he photographs them or obtains pictures. Historic scenes are dug out of books and reproduced. He then makes water-color drawings on cardboard of each scene, carefully depicting everything. The parts are cut

out and mounted on a miniature stage from two to four feet long. Everything is adjusted by a scale just as architects' working drawings are. This miniature stage is then illuminated, corrections made, if necessary, and then, when accepted, is turned over to the stage carpenter, who constructs everything according to the scale.

Usually scenic artists are specialists and paint exclusively interiors, landscapes, or architectural scenes. They do little of the actual work beyond designing, but entrust all but the most difficult to subordinates, who reproduce their original design. The immense canvases are usually hung against the wall of the back of a stage in some theater and a working balcony erected before it. Such things as cannot be reproduced and enlarged by canvas and frames. as small rocks, fallen trees, broken cannon, etc., are done in papier mache by the property man, who also constructs everything that is not purchasable ready-made. A scene brings from $100 to $1,000, according to the nature and quality of the work.

The Stage Carpenter.

It is the business of the stage carpenter

A MAKEUP IN BLACK AND WHITE FOR A HOTTENTOT MINSTREL SHOW.

to build frames for the scenery, bridges, balconies, etc.; and opportunities for inventive genius abound here, for, in devising reversible scenes, in hinging pieces for convenient packing, and in many other ways, the stage carpenter may demonstrate his value. A clever craftsman makes $50 a week.

The matter of costumes is an important one. To a limited extent actresses are permitted to exercise their own taste in

selecting their gowns, but everything must be approved by the director, for an actress, if given latitude, might choose a color that would clash with the other costumes and the scenery. It has become the practice among managers to patronize the department stores for costumes rather than costuming concerns. The actress secures samples, has them approved, and then takes them to stylish tailors. She is allowed a fair but fixed amount for her gowns, but may add what she chooses at her own expense. Realism and naturalness are the keynotes of the stage to-day, and many of the ball-room gowns seen behind the footlights are made by the same tailors who cater to the wealthiest society women.

When costumes are to represent some previous age, historical accuracy is required and water-color sketches are made as working patterns. Old clothes are hardest to secure. To make a new costume and tear it does not contribute the appearance of age, so rubbing and stains are resorted to. Male actors who are to represent tramps do not hesitate to purchase direct from "Weary Willies," and after fumigation and some washing such costumes are wearable.

Guns From Battle.

The military uniforms, guns and other appurtenances of war used for scenic effects are quite often the witnesses of real battles, and are obtained from professional costumers, who keep on hand the apparel of various ages and countries, which have found their way into their possession after serving their purpose in plays long since abandoned. The wig maker, too, is a specialist, and his skill is usually expensive. An ordinary ready-made wig will bring $15, while a special varies from $25 to $100. Actors frequently allow their beards and hair to grow long when their parts require it, and actresses not uncommonly bleach and dye their tresses, especially if the piece is to have a long run.

Thus it is clear what a mass of detail contributes to the finished theatrical production. There is no inflection of voice,

A POSE FOR THE PLAY AND THE ORIENTAL DANCE—A SCENE FROM CARMEN.

no gesture, no blow, no embrace; there is no scenic view, no costume, no wig, no property of any sort that is not carefully rehearsed and constructed beforehand, and once approved by the director it is never executed in any other way. It is the practice in New York, when bringing out a play, to have the opening night not

in the metropolis, but in some small adjoining town.

The author by this means has an opportunity, before risking a performance before a metropolitan audience, of estimating the effect upon the auditors, and of making alterations and improvements which may be necessary.

RAILWAY BUILDING IN THE KLONDIKE.

How the Franchise was Purchased and by Whom—Obstacles to be Overcome—Opposition of Property Owners.

IN Alaska there is an enterprising little railroad which is pushing itself to the front rapidly, and bids fair to be a factor in the development of those regions. It is the White Pass & Yukon Railroad, and has been in existence for about two years. Although the greater part of the line exists merely on paper, the contractors are rapidly pushing the work, and within a few years a line from Skagway to Fort Selkirk will have been completed.

At present the road extends from Skagway to White Horse Rapids. Considering its size the road compares favorably with any other road in the world. All the miners' supplies, food, etc., are transported on this line. The road heads for Dawson and miners bound to that city are given a little help by the road as it now is. From White Horse Rapids to Ft. Selkirk the line has been surveyed, but the work of construction has been greatly impeded by the weather and topography of the country. There is a remarkable tale connected with the road.

ICE FLOES AND DRIFT ICE OFF OF THE ALASKAN COAST AND IN THE VICINITY OF THE FAMOUS MUIR GLACIER, AND THE WHITE PASS RAILROAD.

Purchased by Chance.

Strange though it may seem, it is a fact that the builders of the road purchased the franchise by chance when they knew absolutely nothing of the country beyond its reputation for coldness. The London firm was that of Close Brothers. Some

enterprising gentleman had acquired a right to construct a railroad in Alaska, but being unable to raise the necessary funds, he sold this right to a London company, which borrowed the money on condition that the loaners be permitted to assume the construction of the road in case the company was unable to see its way through. Close Brothers made the loan, and according to the agreement came into possession of the railroad.

This firm in turn dispatched their American representative, a civil engineer, to Alaska with instructions to build the road. He set about the task, and after many vicissitudes saw the first two miles of road constructed through the main street of Skagway. Much opposition was offered to the erection of the road even by those most benefited by it. Property owners advanced their prices for real estate in hopes of forcing the railroad company to buy. Traders and storekeepers handicapped the company in every way conceivable. But the road was built and is pushing its way through the frozen passes of the Northwest. It will cost when completed about $6,000,000.

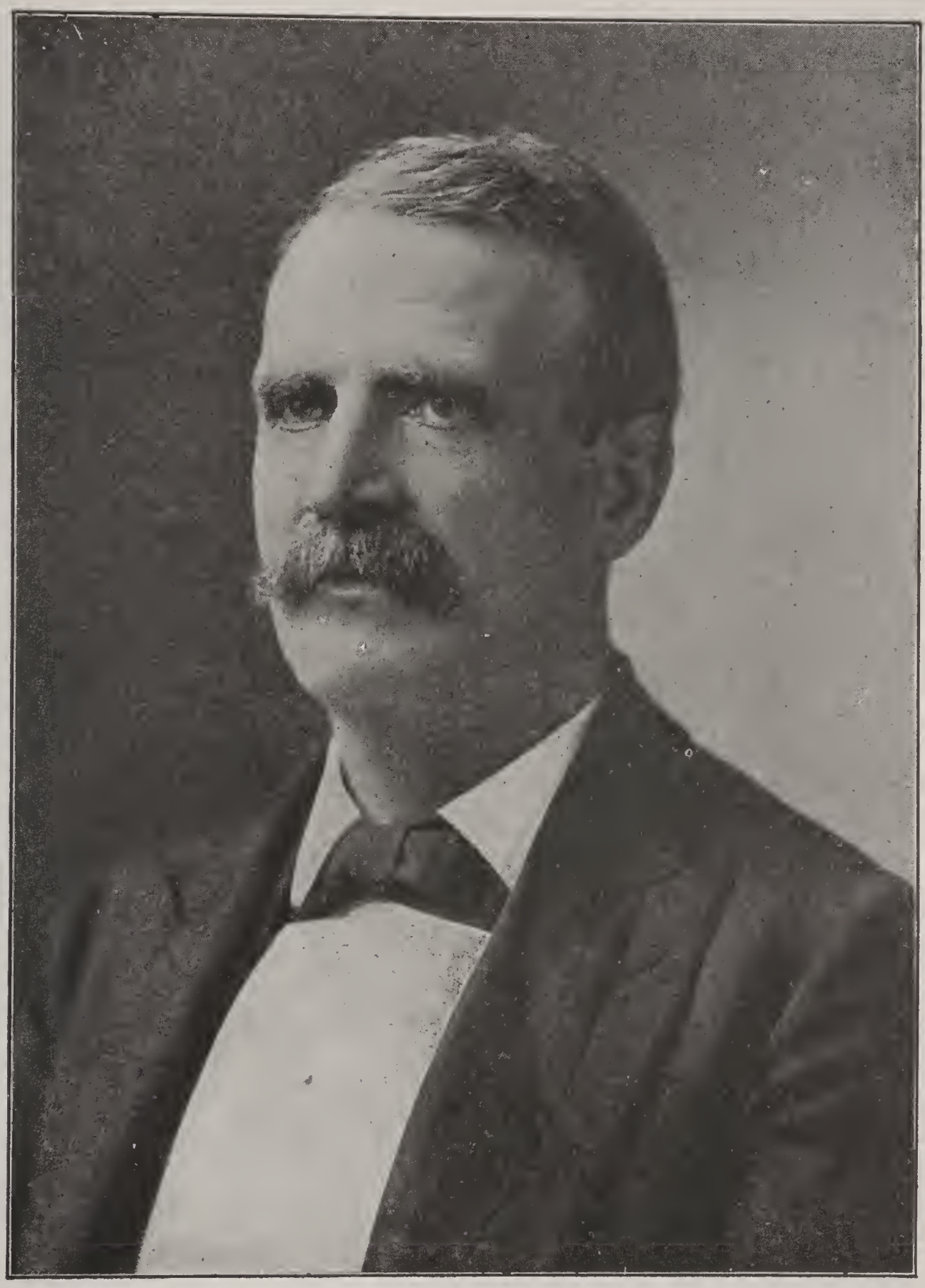
Postal Service of the United States.

Employes, Expenses and Revenues of the Department—Time Saving Devices—Value of Fast Mail Trains.

SOME idea of the enormous work undertaken and carried out by the Post Office Department may be had when it is considered that it directs the operations of 73,570 post offices and has on its pay rolls 200,000 employés. In 1899 the expenses of the department were $105,000,000 and the receipts almost as much,—for it must be said that, despite the efficiency of the department, the government is so liberal in the matter of second class postage that the department is not entirely self-sustaining. In 1898 the various offices handled 6,214,447,000 pieces of mail matter, of which 2,825,767,000 were letters. Thus the government delivers for its citizens every minute of the day some 12,000 messages.

There is a vast difference between the smoothly-working system of to-day, with its lightning mail trains, its free city and rural delivery and its gigantic money order department, and that of the old private pony post of the time of our grandfathers. During the term of office of Timothy Pickering, first postmaster-general under Washington, the receipts and expenditures of the department for a quarter of a year showed an aggregate of only $63,000, which is now spent by the department every six hours of the day. To-day the manufacture and delivery of postage stamps is a gigantic enterprise in itself. In 1898 alone there were made and distributed to the various offices postage stamps to the number of 3,623,821,608, valued at $71,788,333, and pound postage was paid for the carriage of 2,069,742,000 newspapers.

Four great branches, each under the immediate charge of an assistant postmaster-general, conduct the operations of this enormous government business.



HENRY C. PAYNE
Postmaster General

They are: First, the department for administration of the post offices, the carriers and clerical force, and the actual management of the general work of the offices. The annual expenditure of this branch of the service is over $40,000,000. Second, the department for the transportation of mails,—which sees to the contracts for the railway service, etc., and which operates at a cost of $35,000,000. Third, the department that conducts the financial side of the service, furnishes stamps and keeps accounts; and, Fourth, the branch that appoints over 70,000 postmasters and directs the force of inspectors. Besides these departments there is the auditor's office employing 500 clerks and which is a bureau of the Treasury. Through it all post-office accounts pass for scrutiny and audit.

New York Postal Revenue.

Revenue from the numerous offices throughout the country varies greatly, that of the New York post office being more than $8,000,000 annually with a net profit to the government of about $5,000,000, while many of the little cross roads offices do not sell $25 worth of stamps a year. The salaries of the postmasters vary; those appointed by the President

are about 3,800 in number and command not less than $1,000 yearly. The fourth-class offices in which the salary is less than $1,000, are over 70,000 in number and appointments are made by the postmaster-general.

Some of the branches of our service command especial respect, and excel in efficiency similar bureaus in foreign countries. One of those which is greeted with popular approval is the free delivery system which employs 140,000 carriers at an annual expense of $14,000,000 and which brings mail to the door of every resident of the larger cities without the least inconvenience. The marine service on the Great Lakes is marvelous in its magnitude and smoothness of operation. Eight months of the year at the mouth of the Detroit River vessels pass every three and one-half minutes of the day and night. Here every steamer must be met and the mail collected and delivered without slowing up. The great fleet has a postal system which is carried out effectively and which enables every seaman absent from home to receive or send mail without delay. Letters are stamped on the back with the name of the steamer to which they are to go. Water-tight bags are used in case the boats making collections are upset, and so thorough is the system that every boat is met and served as easily as though they were only so many post boxes on land.

Thousands are Employed.

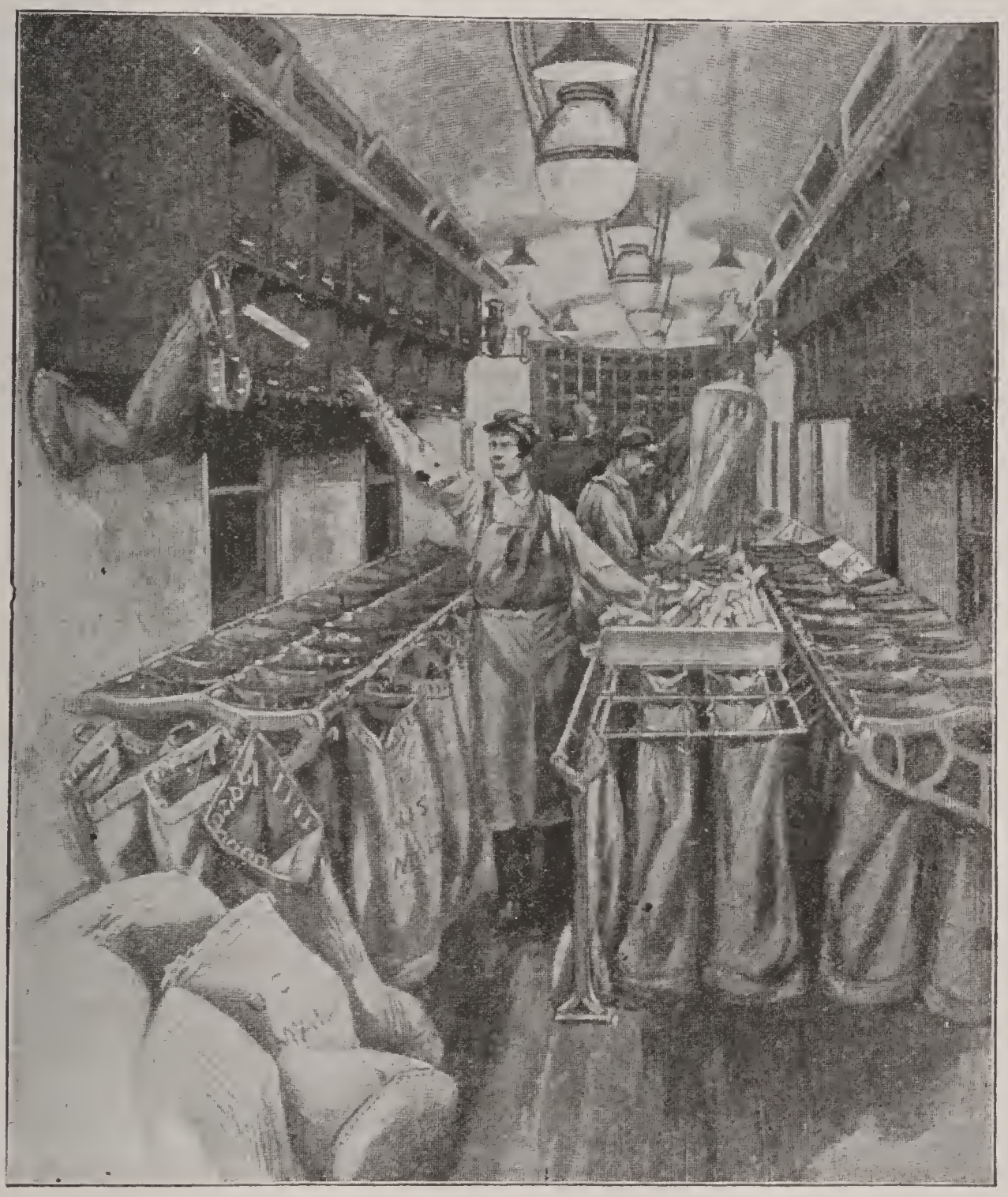
Started in 1864 the railway post office now employs 8,100 men, and had in service in 1898 cars that covered a total of 281,585,612 miles on 174,000 miles of railroad track. In 1884 there were distributed in railway post offices 4,519,661,900 pieces of mail; in 1890, 7,865,434,101, and in 1898, 12,225,706,220, so it may be seen that the increase in that branch of the service is tremendous. To-day, mails are handled, sorted, pouched and delivered to every point desired without the least delay at the distributing point. Clerks on the line must know every office in the territory and no flaw in memory or inaccurate throw to a wrong pouch is excusable. When applicants wish to enter the

A TELEPHONE CONVERSATION.
Showing manner of holding receiver, and answering.

railway service extremely difficult examinations must be passed. The entire scheme of the territory must be memorized. Before this examination was compulsory one error occurred in every 720 letters. In 1884, however, this had been reduced to one in every 4,152. Through changes in the administration in 1888 the efficiency dropped to one error in every 3,694 pieces of mail, and in 1890

even to one in 2 834. Extra diligence on the part of the inspectors has brought back the record, however, to the almost perfect mark of only one error in 10,428 pieces sorted and delivered.

Time saved is the object of the railway service and in order to effect this saving fast mails had to be originated. Now a fast mail train crosses the continent four hours ahead of any passenger trains. Between Chicago and Omaha the lightning rate of from 80 to 90 miles an hour is often reached. To secure this rapid travel small stations must necessarily be skipped. The mail, however, is always picked up and delivered, while the trains rush past, by the "catcher-pouch" system. This consists simply of a post to which is hung the mail bag to be taken on board the flyer, loosely secured with twine or on a hook. A sort of crooked arm is attached to the doorway of the car, which, upon being operated by a lever, reaches out and grabs in the pouch. At the same time any mail to be delivered to the station is thrown off by hand, or, with some systems, pushed by the arm and attached to the post while the other is being collected. This service is rather dangerous, in 1889, sixty-nine clerks were killed and 1,324 injured while on duty.



UNITED STATES POSTAL CLERKS.

At work on a fast mail train between Chicago and New York. Pouching the mail.

Mail Service on Cars.

To save time in the final delivery of the mail intended for the larger cities a city distribution service is maintained on board the fast mail trains, and so effectual is it that the mail may be taken in the bags direct to the sub-stations in the city without a moment's delay. This system of course necessitates employing men who thoroughly understand the lay of the city.

Bags for the service are supplied by contract and are nearly all fed into service through the New York office. The great trend of mail is from the east to the west and from the large commercial cen-

ters to the country. There are certain offices in every district where bags naturally accumulate and whence it is easy to send them once more into the service. Cincinnati and St. Louis are made distributing points and either city is ready to supply from 5,000 to 20,000 bags at one shipment. Each year over a million and a quarter are repaired and fed through the offices at Washington, Baltimore, New York, Chicago, Boston and Philadelphia. The great outflow of bags is around the Christmas holidays, returning the latter part of January, only to pour out from the commercial centers once more in the advertising season in May. Bags of all sorts are in use and new ones are constantly demanded. There must be the bag for the mountain carrier and for the runner on snow-shoes, knapsacks and bags for the Alaska dog teams and saddle bags for the pony express. The latest application for a special equipment called for a perforated bag for mailing queen bees from the Pacific coast to the islands of the Pacific. Heretofore ordinary sealed sacks have been sufficient for mailing these live packages, but the trip across the ocean is so long that the bees are likely to be suffocated.

A word about the celebrated "star" routes is necessary. Considerable scandal prevailed over contracts let for these routes in the early days. The way they obtained their name was by the act of Congress which specified the mail was to be carried over routes which could guarantee "celerity, certainty and security." The mark XXX was used to designate these routes, and when the bribery and fraud arose the natural reference was made to the "star" routes. These lines consist mainly of coach routes, etc., and altogether there are in operation some 2,200 of them. There are four seasons, one each year, for making bids for these contracts and the forty-one bids for each route in 1898 aggregated 218,000. Bidders are mainly speculative, and it is an old fact that the local carrier will eventually do the work for the successful bidder more cheaply than he does it at first hand for the government. The longest star route is from Juneau, Alaska, via Circle City in the same territory, along the Yukon River, to Tanana, a distance of 1,618 miles. The next longest is from Tanana to St. Michaels, 900 miles.

Big Money Orders.

The money-order division of the post-office department is one of the greatest clearing houses in the world. In 1898 money orders to the number of 29,000,000 were issued for amounts totaling $205,000,000. Three hundred and fifty clerks are employed in this division who do nothing all day long but add up long columns of figures. Our money order department, however, is far behind many European offices. Germany issued in 1898 100,000,000, amounting to $1,800,000,000; Great Britain, $310,000,000. But it may be explained that the post office money order system has been established longer in those countries.

Letters that are misdirected, unaddressed or unclaimed, and which have to go to the dead letter office for identification number 20,000 every year. In 1898 nearly $1,000,000 was thus sent back to its rightful owners. The same year over 50,000 parcels with no addresses at all, and many of them containing snakes, dynamite and curious freaks were disposed of by the office.

Until 1874 there were no uniform rates for foreign mails. What rates there were were regulated mainly by treaties with the separate countries. To-day, however, five cents will carry a letter around the globe to find the person to whom it is

addressed. There are no general contracts with steamers, but rather fixed rates. On three liners there are sea post-offices the same as on our fast mails, and mails thus transported may be given directly to the carriers in the local districts for delivery without going through the land offices. In the harbor of New York the transfer boat "Postmaster General" meets all steamers and carries the tons of mails between them and the trains.

Postal Delivery Post.

One feature being developed by the mail service is that of carrying parcels.

At present in the Western Hemisphere sixteen countries and colonies can be reached by service that will carry packages weighing up to eleven pounds. This branch is growing also in Europe, and threatens to undo the express companies. The postal delivery is a great convenience to the public.

BORES IN THE EARTH.

Europe Leads in Great Tunnels—France and Italy Have Many in the Alps—The Great St. Gothard's Bore—One Sought for the English Channel —Method of Driving Through a Mountain Wall—Tunnels in the United States.

THE United States, though it passes the world in many respects, does not lead as a country of tunnels. The only American tunnel more than a mile and a quarter long is the Hoosac, which has a length of four and three-quarter miles, and in which the builders broke no records except those for slowness and expense. It cost $15,000,000, and took twenty-one years to build.

The regions in which tunnels reach the greatest size are those of the Alps, where the people point with pride to the Arlberg tunnel, six and a half miles long; the Mount Cenis tunnel, seven and a quarter miles; the St. Gothard, nine and a quarter miles long, and the Simplon, which will be twelve and a quarter miles in length when its builders get through the mountain.

It was about 1855 when the people of France and Italy became tired of walking over the Alps, and packing by mules, and they resolved to have a tunnel. They began work in 1857 and proceeded to cut their way into the heart of the everlasting hills with pickaxes and crowbars. Working both in France and Italy, they could bore only eight feet a day, and in some places only two feet a day. After digging at the living rock for five years it occurred to a Frenchman named Sommeiller that time could be saved by the use of machinery. He invented a drill that could bore a hole in twenty minutes that two workmen could not dig in two hours. After that the tunnel in the Alps progressed more rapidly, and toward the finish the progress was fourteen feet a day. The tunnel was finished in 1871.

The Famous St. Gothard's.

Tunnel communication was hardly established between France and Italy when work on the St. Gothard railway was begun. This resulted in connecting Italy and Switzerland through the most stupen-

dous system of tunnels in existence. This road, though quite short, cost more than $52,000,000. It passes through one of the most mountainous countries in the world, crossing fourteen viaducts, 115 bridges and traversing seventy-nine tunnels, having a total length of nearly thirty-one miles.

Running southward from Lucerne the St. Gothard railroad follows the valley of the Reuss River, rising gradually as it passes the jagged Spannorter and the strangely contorted glacier of Schlossberg. Every mile of progress means an ascent. The route lies past the Bristenstock, the Oberalphstoch and the Grosse Windgall, — mountains over 10,000 feet high. At last, when the grade becomes so steep that no train can climb it, the locomotive dives into the interior of the mountain and begins climbing upwards after the fashion of a corkscrew. Inside the Pfaffnesprung loop tunnel the train mounts 155 feet, coming out on a terrace where the ascent is less difficult, and then plunging into the Wattinger loop tunnel, in which it ascends seventy-five feet. The route then turns upon itself and the train countermarches in a long loop to the Liggestine loop tunnel, in which an ascent of eighty-two feet is made.

Presently the great tunnel of St. Gothard is reached and the train clangs through nine and a quarter miles of solid rock. It then begins its descent, corkscrewing its way down through the insides of four mountains, at last reaching the plains, more than 3,000 feet below.

A solid mile of earth presses down on the tunnel of St. Gothard, and above it 6,000 feet towers the Kastelhorn. The tunnel passes under the Lake of Sella, and between the lake's bottom and the roof of the tunnel is two-thirds of a mile of earth and rocks. A thousand feet above the tunnel there is a village called Audermatt, standing by itself on a little lonely plain. The pressure of the earth at this point on the tunnel was so great that it crushed the tunnel twice, and now it is only held intact by huge arches of masonry, fifteen feet thick at the sides, and ten feet at the roof. It took nine and a quarter years to build the St. Gothard tunnel,—a year for each mile,—and its cost was $11,350,000. With all the improved drills, compressed air, etc., the workmen averaged only fourteen and a half feet of progress a day.

ST. GOTHARD'S FAMOUS TUNNEL ENTRANCE, PIERCING THE ALPS. IT IS 9¼ MILES LONG.

Great Bores of the Alps.

The third great transmontaine tunnel is the Arlberg. It is six and a half miles long,—almost as long as the Mt. Cenis,—and yet it took less than one-fourth as long to build it. Begun in 1880, it was finished in 1884, having progressed at a rate of twenty-seven and three-quarters feet a day. It connects the province of Von Arlberg with the rest of the Austrian Tyrol through the Arl mountains and facilitates trade between Austria-Hungary and France.

One of the earliest European tunnels built successfully was that by Prince Torlonia, between 1854 and 1876, at a cost of $4,800,000, and was over the route used in the old Roman days by Emperor Claudius. That ruler is said to have employed 30,000 laborers upon it for eleven years, the purpose being to drain Lake Fucino which at that time covered 48,000 acres of arable land. Soon after the Roman tunnel was completed it fell into ruins and remained useless until restored by Prince Torlonia. It is now three and a half miles long and is in places 400 feet below the surface of the earth.

The first tunnel built in the United States was constructed between 1818 and 1821 and was on the Union Canal. It was 450 feet long, twenty feet high and eighty feet wide and has long since been made into an open cut. A noted subaqueous tunnel in America is that built by the Grand Trunk Railway under the St. Clair River. It took twenty months to make this bore of 6,050 feet and the cost was $3,000,000.

Wolseley Opposed a Tunnel.

The boldest tunnel ever projected was that under the Straits of Dover, which would have been twenty-one miles long. Lord Wolseley declared that it would facilitate the invasion of England from France, therefore it was abandoned. Two of the most recent tunnels are under the Thames River at Blackwall for carriages, and under the Spree River in Germany for street cars. The Croton aqueduct which carries water to the city of New York is thirty-three miles long and is one of the greatest engineering feats in the world. The longest under-water tunnel in the world is that under the Severn River in England. It is four and a half miles long and was opened in 1885 after twelve years of building. Several times there were breaks in this tunnel, followed by an inflow of water, and once a high tide flowed into the shafts and swamped the whole tunnel. Divers were employed to close the bulkhead doors, which were 1,000 feet from the shaft, but were unable to carry the rubber air pipes that far. At last the chief diver took the dangerous task, and tying a reservoir of compressed air on his back waded through the water and closed the doors.

The western railroads of the United States have many notable tunnels. There is one on the Great Northern in Montana which is over 6,000 feet in length. Mullen's tunnel, on the Northern Pacific Railroad, pierces the Continental Divide of the Rockies. American railway builders avoid tunnels as much as possible, substituting for them horseshoe curves and loop curves, rising one upon the other. These are less expensive than tunnels and give comparatively easy access to the mountain heights.

NATIONAL PATENT LAWS.

They are Issued in the Name of the United States—Granted to Any Rightful Inventor—No Separate Patents Issued—Manner of Taking Oath—Fees That Are Charged.

PATENTS are issued by and in the name of the United States under the seal of the Patent Office to any person who has invented any new and useful art, machine, manufacture or composition of matter, or any new improvement thereof, not used or known by others in this country, not already patented, and not printed or described in any publication of this or any foreign country prior to the discovery, and not on sale or in public use for more than two years before application unless same can be proved to be abandoned. Patents are granted to any person who, by his own industry, genius, effort or expense, has invented and brought forth any new and original design for manufacture, bust, statue, alto-relief or bas-relief; designs for printing woolen, silk, cotton or other fabric; any new or original ornament, impression, pattern print or object to be printed, painted, cast or otherwise to be reproduced; or any new shape of an article for manufacture not heretofore patented, produced or described in a printed publication.

Every patent contains a grant to the patentee, his heirs or assigns for the exclusive right for seventeen years to the use of his discovery in the United States and the territories. If an inventor believes at the time of application that he is the discoverer of the invention, and part of his article for patent has already been known in a foreign country, the patent will not be denied, if it has not been patented or described in a printed publication

No Separate Patents.

When two persons work together on an invention they cannot receive separate patents on the several parts of such invention, but must have a joint patent, which cannot be claimed separately.

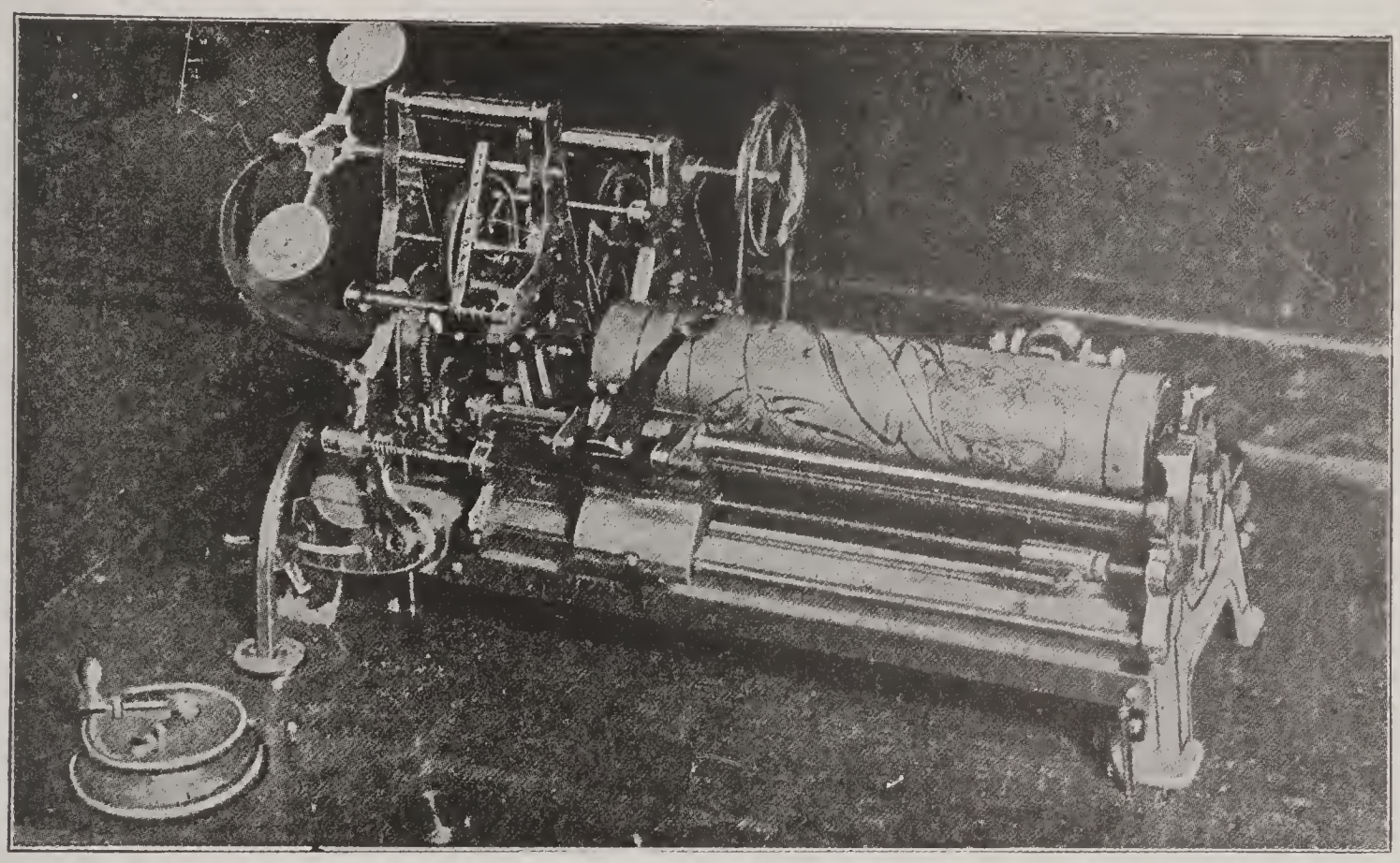
If a foreign patentee apply for a patent in this country the fact that the invention has been patented in a foreign country will not prohibit him from securing it unless the article patented has been put into use here more than two years prior to the time of application. But every patent thus applied for will expire at the time of the foreign patent, unless there are more than one, in which case the United States patent will expire at the same time as that which has the shortest unexpired time, and in no case will a patent run more than seventeen years.

Applications for a patent must be made in writing to the Commissioner of Patents, and at the same time there must be filed in the Patent Office a written description of the invention with its manner of making, construction, compounding and method of use in such clear and concise language as to enable any person versed

in the science to which it pertains to be able to make it. In the case of a machine the principle must be explained and the best mode for its use be provided, so as to distinguish it and its improvements from other similar inventions. These specifications must be signed by the inventor and attested by at least two witnesses. When the nature of the case admits of a drawing of the invention the patentee must furnish one copy signed by himself and attested to by two witnesses, and

missioned member of the diplomatic corps of the United States, stating that he believes his invention to be new and original, that he is the rightful discoverer and that the same has never before been known or used. After filing such an application, the patentee if the Commissioner thinks an issue is justified, shall upon the payment of the lawful fees receive letters patent.

Assignments are lawful, and any patent or interest therein shall be assigned



A CURIOUS PATENT.

The machine by which great newspapers telegraph pictures to each other over ordinary telegraph wires, the same as news. Used by the New York *Herald* and Chicago *Times-Herald*.

when a model is possible the applicant, if required by the Commissioner, shall furnish a model of convenient size to exhibit to advantage the several parts of his invention or discovery.

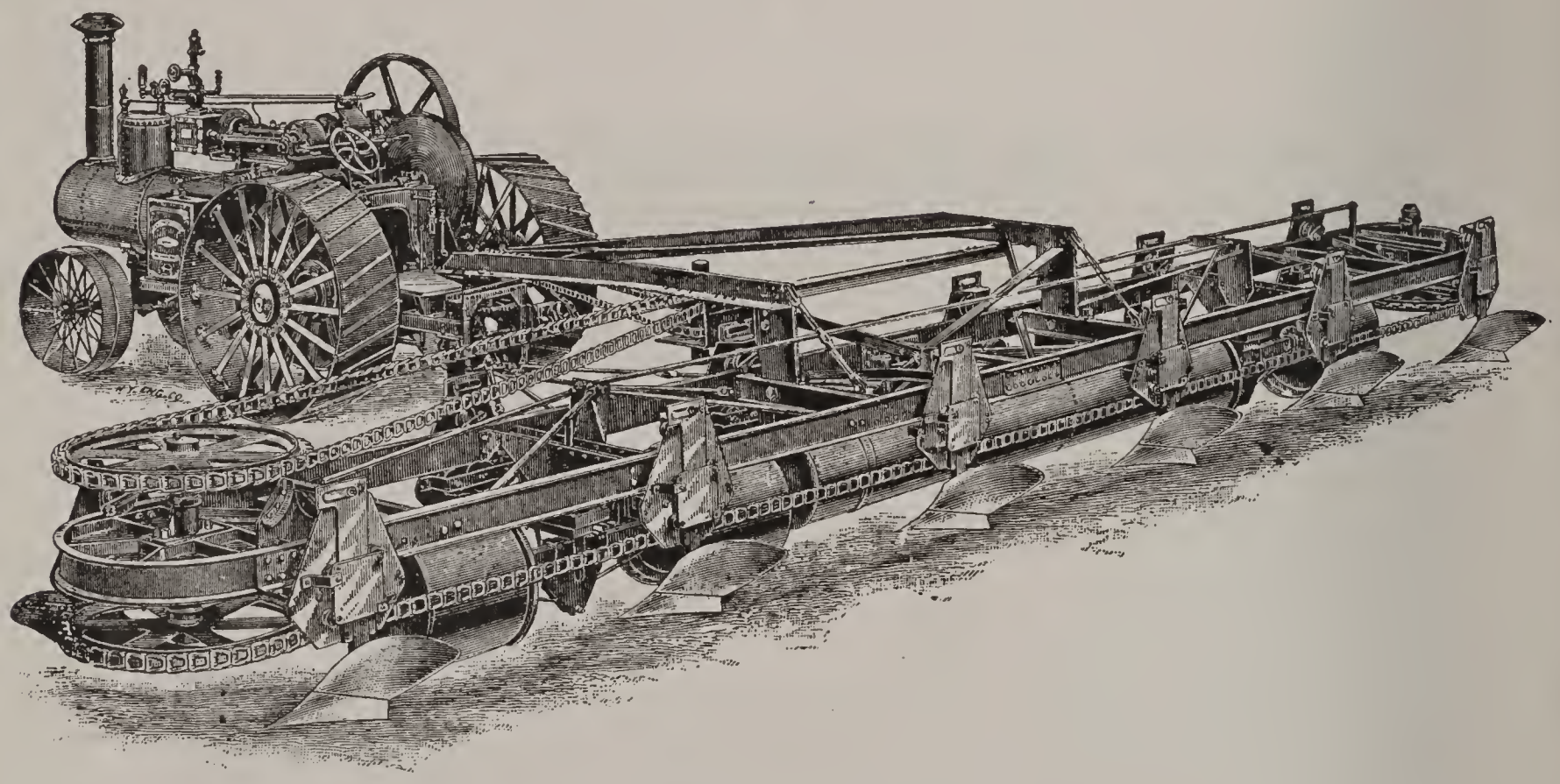
How to Make Oath.

The applicant for a patent must make an oath before some person in the United States authorized to administer it, or if residing abroad before some duly com-

by an instrument in writing, and the patentee or his assigns may grant and convey an exclusive right under his patent to the whole or any specified district of the United States for the use or sale of his patent. In case of an error or inadvertence, where more is claimed by the patentee than he is entitled to, the patent becomes invalid. But by filling out certain papers showing such error to be by mistake or accident the reissue will be granted.

Explanation of a Caveat.

Caveats, under the patent law, are notices by which the caveator informs the Commissioner of Patents that he has an invention, in order to prevent a patent to another of the same alleged invention upon an application during the life of the caveat without notice to the caveator. A caveat may be secured on payment of a $10 fee and filing the distinguishing characteristics of the invention with the Patent Office, and will protect the inventor from any other inventor securing letters patent on such an invention during the life of the caveat, or one year. An alien in the United States has this privilege in common with an American citizen, provided he has lived here one year prior to filing the caveat and has declared his intention to become naturalized. Patent fees must be in advance, and are: On filing original application, $15. In design cases, for three years and six months, $10; seven years, $15; fourteen years, $30. Filing caveat, $10. Each application for reissue of a patent, $30. Filing each disclaimer, $10. For certified copies of patents, printed copies, etc., 10 cents per hundred words. Recording assignments, powers of attorney or other papers, three hundred words or under, $1; over three hundred words and under a thousand words, $2; over a thousand words, $3. Reasonable charges are made for copies of drawings. All letters in regard to patents should be addressed to the Commissioner of Patents, Washington, D. C.



A STEAM PLOW.

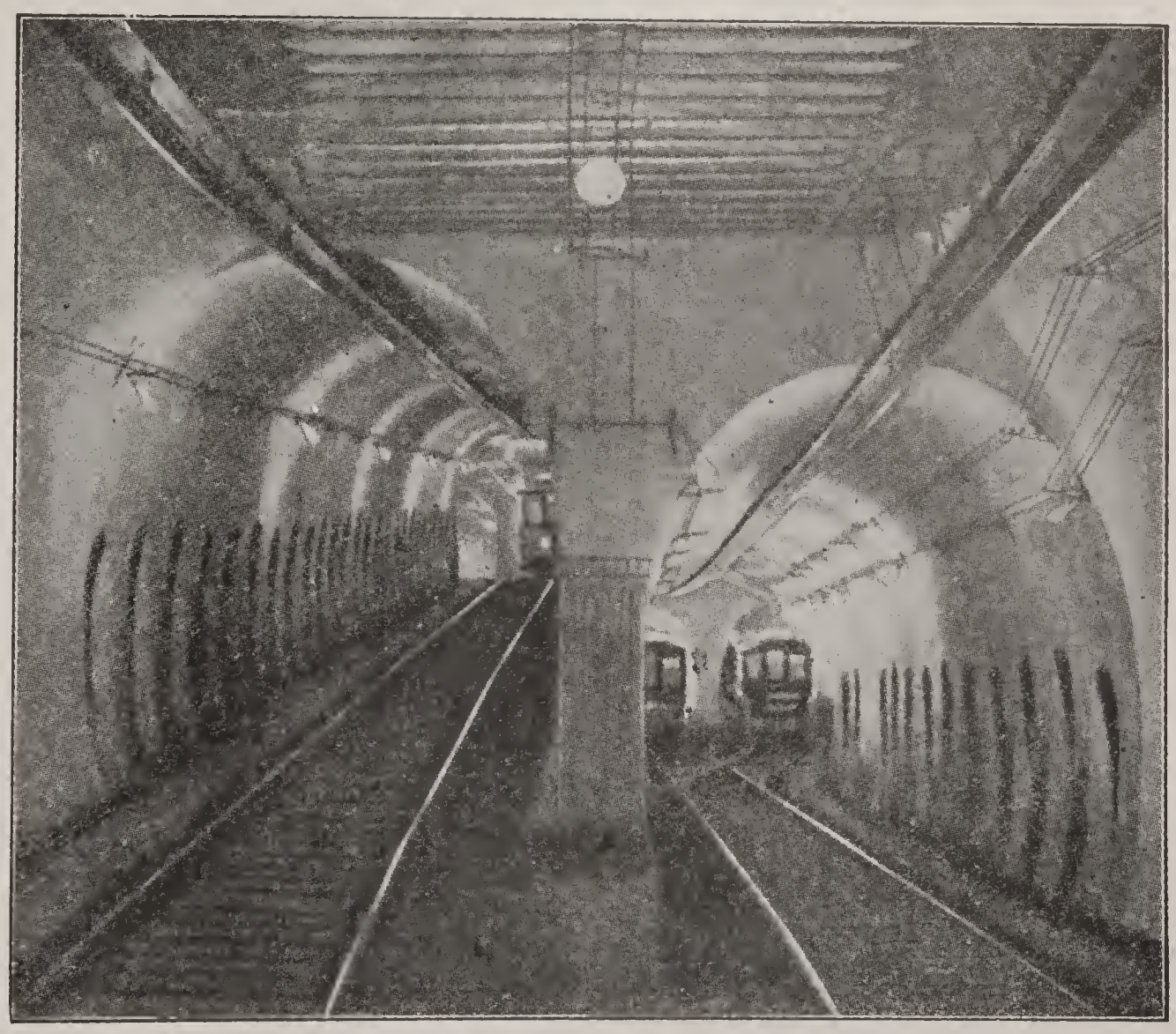
The travel of the plows is at right angles to the travel of the engine. The plow has been given a successful trial.

UNDERGROUND RAILROADS.

London's Great System Now in Use—Millions Expended on the Work—New York Starting to Build in this Way—Speed Which May be Attained.

FOR years the greatest engineers in the world have been trying to devise some scheme for removing the street car from public thoroughfares. This has been accomplished, and a problem which formerly seemed gigantic was made practical by Londoners. In the great metropolis of the world there are three underground railroads. These lines have a mileage of 105 miles, and it is the greatest and only system of its kind in the world. Something like $200,000,000 were expended in its construction, but the owners are being rapidly repaid for their great work.

The system is the work of several years and scores of contractors were employed before the monstrous task was completed. London, however, will not enjoy its distinction in this line alone. New York, which is its greatest rival in commerce and population, will also rival, if not surpass, it in the underground railroad proposition. The New York Rapid Transit contract is the largest single contract ever let, and is in the hands of John B. McDonald. It is a great undertaking when it is considered that this man attempts to solve in three years the transportation question for the most crowded city on earth; to dig twenty-one miles under streets which are alive with traffic



AN UNDERGROUND RAILWAY.

Showing the shape of the tunnel and the manner in which cars pass each other. This is the Boston method.

and threaded with conduits, sewers, and gas mains.

Its Speed.

According to the announcement of the promoters the new railroad, when completed, will make possible the traversing of a territory twenty-one miles in extent, in eighteen minutes. By the present system, it requires one hour. The line will be an electric road, with individual motive power fitted to each car, which is new for underground railroads. The entire right of way has been surveyed and even minor details have been arranged for. The tunnel will be fifty feet wide and seventeen feet high. It will traverse the city from the post-office to Ninety-sixth Street. The tunnel will be so constructed that four tracks will be accommodated. Two will be used for express service and two for local. Where the tunnel will run near the surface—at stations—the roof will be flat and constructed on pillars.

From the post-office to Thirty-third Street will be one main tunnel. At this point the tunnel will branch into two tunnels, owing to the Fourth Avenue tunnel, which begins at that point and runs near the surface. At Forty-second Street the single tunnel will be resumed and continue to the terminus at Ninety-sixth Street. The underground stations will be entered from the sidewalks. There will be separate staircases for entrance and exit. The station walls will be constructed of enameled brick and electric lights will be placed in niches in the walls.

MANUFACTURE OF SALT.

Apparatus for Mining Purposes—How it is Manufactured—Famous Wells at Manistee and Their Capacity.

KANSAS, once regarded as a desert, is now one of the best salt fields in the United States. In the vicinity of great forests, where saw mills are located, it is common to erect "salt blocks" in order to make use of the refuse of the saw mills as fuel. One of the states that thus manufactures a great deal of salt, and has employed one of the best methods of manufacture is Michigan. Near Manistee, underlying the great forest, is a stratum of rock salt from twenty-five to thirty feet thick and lying about 2,000 feet below the surface.

To mine this salt a derrick about eighty feet high is built over a point selected for a well and the work of driving commences. A ten-inch pipe is sunk by means of a sand pump to a depth of about 400 feet, and then within this pipe is inserted an eight-inch pipe, both being driven to the rock stratum. From the well thus constructed an air pump forces brine to the surface at the rate of 2,000 to 2,400 barrels in twenty-four hours.

Storage Cisterns.

As the brine is pumped up it is delivered to storage cisterns, whence it is pumped later on to be subjected to a system of boiling and evaporation to reduce it to granular salt. From the cisterns it is taken off to settlers where it

is heated to 170 degrees F and then allowed to cool so that the impurity of gypsum will be removed by precipitation. If this were not done the gypsum would form a coating on all the steam pipes and clog the machinery.

Then the brine is drawn off into a long box which extends over the end of a device called a "grainer." The grainer is a long shallow tank, in the bottom of twenty-four hours there will be a layer six to eight inches deep. From this trough the salt is lifted by perforated shovels to a runway, whence it is shoveled into carts as soon as it is drained, and is taken to the storage bins and dumped.

Manistee Salt Wells.

One plant near Manistee consists of five wells, three cisterns, each 18 feet wide by

GREAT SALT BEDS, WORKED BY THE NATIVES, NEAR MAKHOA, COREA.

which is a series of steam pipes. The brine being admitted to the grainers, the steam is turned on, the liquor soon reaches a high temperature, and rapid evaporation takes place. To assist in the formation of the grains of salt by evaporation, the brine is stirred by a series of paddles worked by a lever. The salt rapidly accumulates at the bottom of the grainer as the brine cools off, and in 100 feet long and 8 feet deep, and six settlers, 175 feet long and 8 feet deep, capable of holding 24,000 barrels of brine. When these cisterns and settlers are full they hold enough brine to manufacture 10,000 barrels of salt.

Part of the salt manufactured is treated to what is known as the "vacuum-pan" process. This consists of heating the brine in a large air-tight cylindrical

boiler by steam heating process. Part of the air pressure is removed, which allows the brine to boil at 150 degrees. So rapid is the evaporation of the salt by this method that the grains fall to the bottom of the "pan," and by means of an endless belt "bucket" elevator the salt is automatically carried and dumped into drainage bins. Here it drains for about eighteen hours, and then is stored in bins. It is unusual to work the vacuum plants over twelve hours, since they should be cleaned out with fresh water frequently. Some plants have two pans, one for night and another for day work. Each can turn out from 600 to 700 barrels of salt a day.

Great Salt Bins.

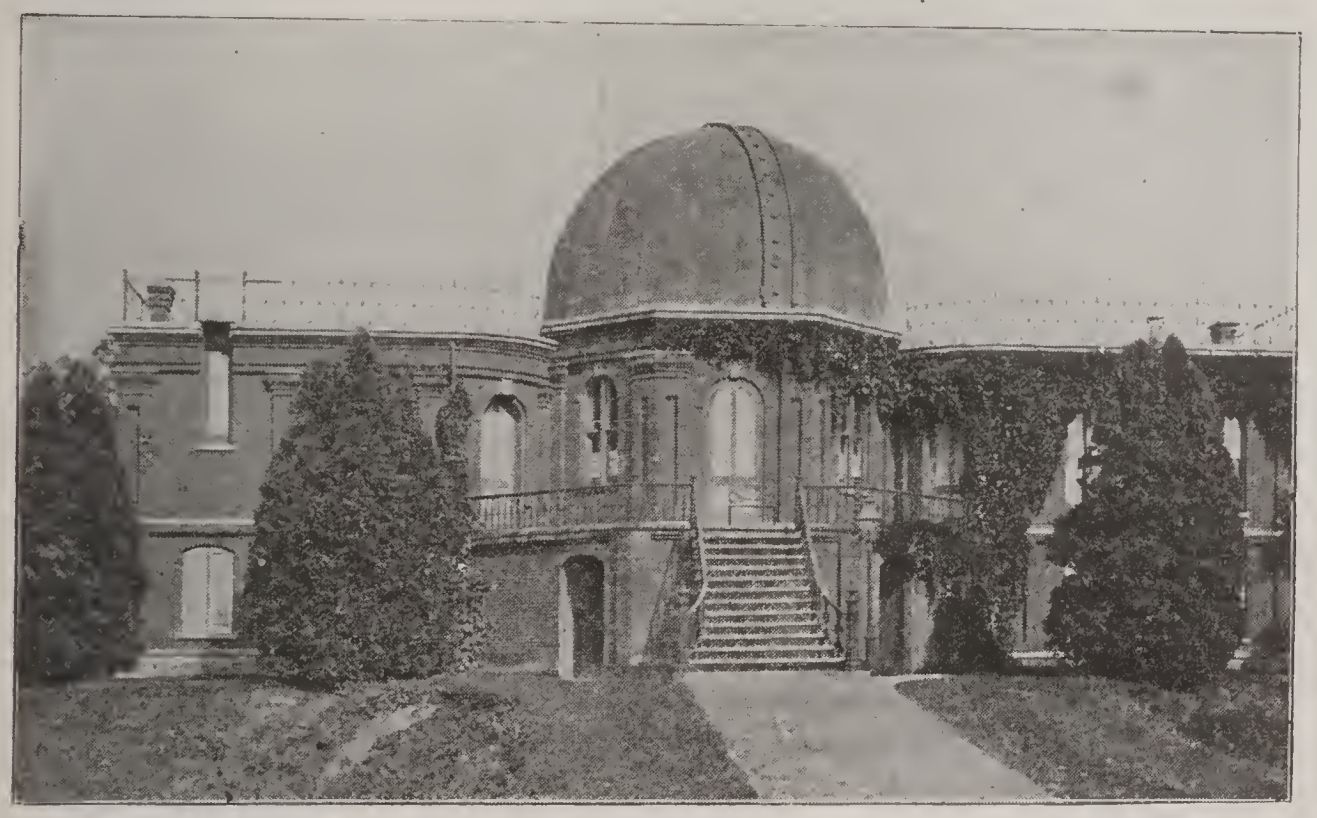
Manufacturers of salt generally keep a large supply on hand in their bins, some of which are 200 or 300 feet in length. Frequently the salt becomes caked and hard. Then a gang of men must use shovels and picks to loosen it up for packing in barrels. The coarser grades do not pack so hard, but vacuum-pan salt sometimes becomes like a wall of marble. Then it is dangerous work to undermine it. To overcome the delay thus occasioned, ten-inch compressed-air driven augurs are used to drill holes in the stored salt. These augurs are mounted on trucks, and can readily be shifted about. A row of holes driven under the salt about ten inches from the floor to a depth of about six feet will bring down enough salt in a half-day's work to keep a gang of men busy packing for several days.

The salt wells of Kansas are found in the western part of the State, and those of Syracuse, New York, are quite famous. Vast quantities of salt are now obtained from Salt Lake, in Utah, by the evaporation and drying process. The salt producing States of the United States are New York, Michigan, Ohio, Louisiana, West Virginia, Nevada, California, Kansas and Utah.

OUR NATIONAL TIME.

How Solar Time is Determined—Regulating the Clocks of the Country—A Million a Year for Telegraph.

TIME is bought and sold throughout the United States to the extent of one million dollars' worth per year. The Western Union Telegraph Company is the monopolistic agent in this marketing of time. An important part of the daily routine at the Naval Observatory in Washington is the determining and free distribution of the correct time at noon each day. The government's salaried experts make the computation, and communicate by the pressure of a button the precise hour of noon to each of the official departments in the city. The Western Union is permitted to keep its instruments in the observatory room from which the noontime message is flashed.



THE QUAINT OBSERVATORY AT VASSAR COLLEGE, POUGHKEEPSIE, NEW YORK.

Used by young women students. The stars are studied here.

There is direct communication by beats from the official clock to the telegraphic instrument, so that the services of an operator are not required. Just before twelve each day all business must be taken off the wires controlled by the Western Union Company. Three minutes before noon, wire chiefs in each of the principal cities and the towns and cities leading to and from their larger sisters, cease sending or receiving messages, and devote themselves to switching on wires in such a way as to make an unbroken chain of communication from Washington around the uttermost boundaries of the United States. This is called an "unbroken national circuit." Ten seconds before the time bell strikes, there is silence; then a mighty throb, a titanic heartbeat from the foremost factor in modern commerce, and an electric current pulsates from east to west, from north to south, announcing the fact that the sun has passed over the

seventy-fifth meridian and it is noon at Washington.

The manner in which the telegraph company reaps a rich harvest in the distribution of time is as follows: Those who have clocks and find it necessary to keep them right, to the fraction a of second, are willing to pay for such accuracy, and the Western Union first made the discovery that time is a profitable commodity. The clocks of the United States are kept correct by electricity for a nominal yearly fee, and in New York alone some 7,600 clocks are regulated daily and supplied with absolute solar time. For this service a charge of $15 a year per clock is made. This yields the telegraph company an annual income in the metropolis of $114,000. With 70,000 clocks to look after, it is easy to see how one million dollars is obtained annually.

Rarely Seen by Public.

Most of these electric clocks are never seen by the public. Dozens of them are in the big public buildings of the larger cities, in private offices, and in a single newspaper office in New York some fifteen timepieces are regulated from Washington.

The clocks that are set every noon in a thousand cities and towns by the mere pressure of a button in Washington are equipped with a peculiar electric contrivance, so that the current passes through them and springs the hands of each timepiece simultaneously to the point of twelve. While correct time is usually

THE LICK OBSERVATORY, MT. HAMILTON, CALIFORNIA.

Containing the next to the largest refracting telescope in the world. The largest was at the Paris Exposition of 1900.

referred to as solar time, the government timekeepers do not reckon solely by the sun, but by the so-called "fixed" stars, which are so far distant that their position with relation to the earth does not change within months or even years. Thus star time is the only true time. The astronomical operator looks through his big telescope, and watching for a given star knows when that particular star will cross the plane of earth line of the meridian. As it crosses he records the moment it does so, the time being given him by a clock having a twenty-four hour dial.

Then consulting a printed table the operator finds at just what number of hours, minutes and seconds the star in question must actually have crossed the meridian plane. The table being absolutely correct the difference shown between it and the clock proves to what extent the latter is wrong.

The clock is never set right. Allowance is simply made in subsequent calculations for the errors discovered, and these errors amount only to an infinitesimal part of a second in many days. After this procedure the corrected time as taken from the clock is reduced to solar or sun time, which involves considerable figuring, inasmuch as the star year is one day longer than the sun year. The solar time clock in the observatory is consulted at this point and the extent to which this varies from the truth having been ascertained, allowance is made for the error in sending the new message throughout the country.

COAL MINING NEAR TAYUEN FU, CHINA.

THE LARGEST THINGS IN THE WORLD

HIGHEST NATURAL BRIDGE in the world is at Rockbridge, Virginia, being 200 feet high to the bottom of the arch.

LARGEST CIRCULATION of paper money is that of the United States, being 700,000,000, while Russia has 670,000,000.

LARGEST INSURANCE COMPANY in the world is the Mutual Life of New York City, having cash assets of $108,000,000.

MOST REMARKABLE ECHO known is that in the castle of Simonetta, two miles from Milan. It repeats the echo of a pistol sixty times.

LARGEST VOLCANO in the world is Etna. Its base is 90 miles in circumference; its cone 11,000 feet high. Its first eruption occurred 474 B. C.

LARGEST TREE in the world, as yet discovered, is in Tulare County, California. It is 275 feet high, and 106 feet in circumference at its base.

LARGEST DESERT is Sahara, in Northern Africa. Its length is 3000 miles and breadth 900 miles; having an area of 2,000,000 square miles.

LARGEST DIAMOND in the world is the Braganza, being a part of the Portuguese jewels. It weighs 1880 carats. It was found in Brazil in 1741.

TALLEST MAN was John Hale, of Lancashire, England, who was nine feet six inches in height. His hand was seventeen inches long and eight and one-half inches broad.

HIGHEST MONUMENT in the world is the Washington monument, being 555 feet. The highest structure of any kind is the Eiffel Tower, Paris, finished in 1889, and 989 feet high.

IT IS CLAIMED that crows, eagles, ravens and swans live to be 100 years old; herons, 59; parrots, 60; pelicans and geese, 50; skylarks, 30; sparrow hawks, 40; peacocks, canaries and cranes, 24.

GREATEST CATARACT in the world is Niagara, the height of the American Falls being 165 feet. The highest fall of water in the world is that of the Yosemite in California, being 2550 feet.

MOST ANCIENT CATACOMBS are those of the Theban kings, begun 4000 years ago. The catacombs of Rome contain the remains of about 6,000,000 human beings; those of Paris, 3,000,000.

LARGEST NUMBER OF CATTLE ever received in one year was that of Chicago in the year 1884, being 1,874,984 beeves, 30,223 calves, 5,640,625 hogs, 749,917 sheep, and 15,625 horses. It required 9000 trains of 31 cars each, which, if coupled together, would reach 2146 miles.

LARGEST PRODUCING FARM in the world lies in the southwest corner of Louisiana, owned by a northern syndicate. It runs one hundred miles north and south. The immense tract is divided into convenient pastures, with stations of ranches every six miles. The fencing alone cost nearly $50,000.

UNION ARCH of the Washington Aqueduct is the largest in the world, being 220 feet; 20 feet in excess of the Chester Arch across the Dee in England; 68 feet longer than that of the London Bridge; 92 feet longer than that at Neuilly on the Seine, and 100 feet longer than that of Waterloo Bridge, London. The height of the Washington Arch is 100 feet.

LARGEST SHIP ever built, the Great Eastern, recently broken to pieces and sold to junk dealers, was designed and constructed by Scott Russell, at Maxwell, on the Thames. Work on the giant vessel was commenced in May, 1854. She was successfully launched January 13, 1858. The launching alone occupied the time from November 3, 1857, until the date above given. Her total length was 680 feet; breadth, 118 feet; total weight when launched, 12,000 tons. Her first trip of any consequence was made to New York in 1859-60. She has been broken and sold for old iron.

IN 1775 there were only twenty-seven NEWSPAPERS published in the United States. Ten years later, in 1785, there were seven published in the English language in Philadelphia alone, of which one was a daily. The oldest newspaper published in Philadelphia at the time of the Federal conven-

tion was the *Pennsylvania Gazette*, established by Samuel Keimer, in 1728. The second newspaper in point of age was the *Pennsylvania Journal*, established in 1742 by William Bradford, whose uncle, Andrew Bradford, established the first newspaper in Pennsylvania, the *American Weekly Mercury*, in 1719. Next in age, but the first in importance, was the *Pennsylvania Packet*, established by John Dunlap in 1771. In 1784 it became a daily, being the first daily newspaper printed on this continent.

STATISTICS OF TWENTY LEADING LIBRARIES in this country show that, of over $500,000 spent, a little over $170,000 spent was devoted to books, while other expenses consumed $358,000. In the Mercantile Library of New York City it cost 14 cents to circulate a volume; in the Astor, 14½ cents are

THE EIFFEL TOWER.

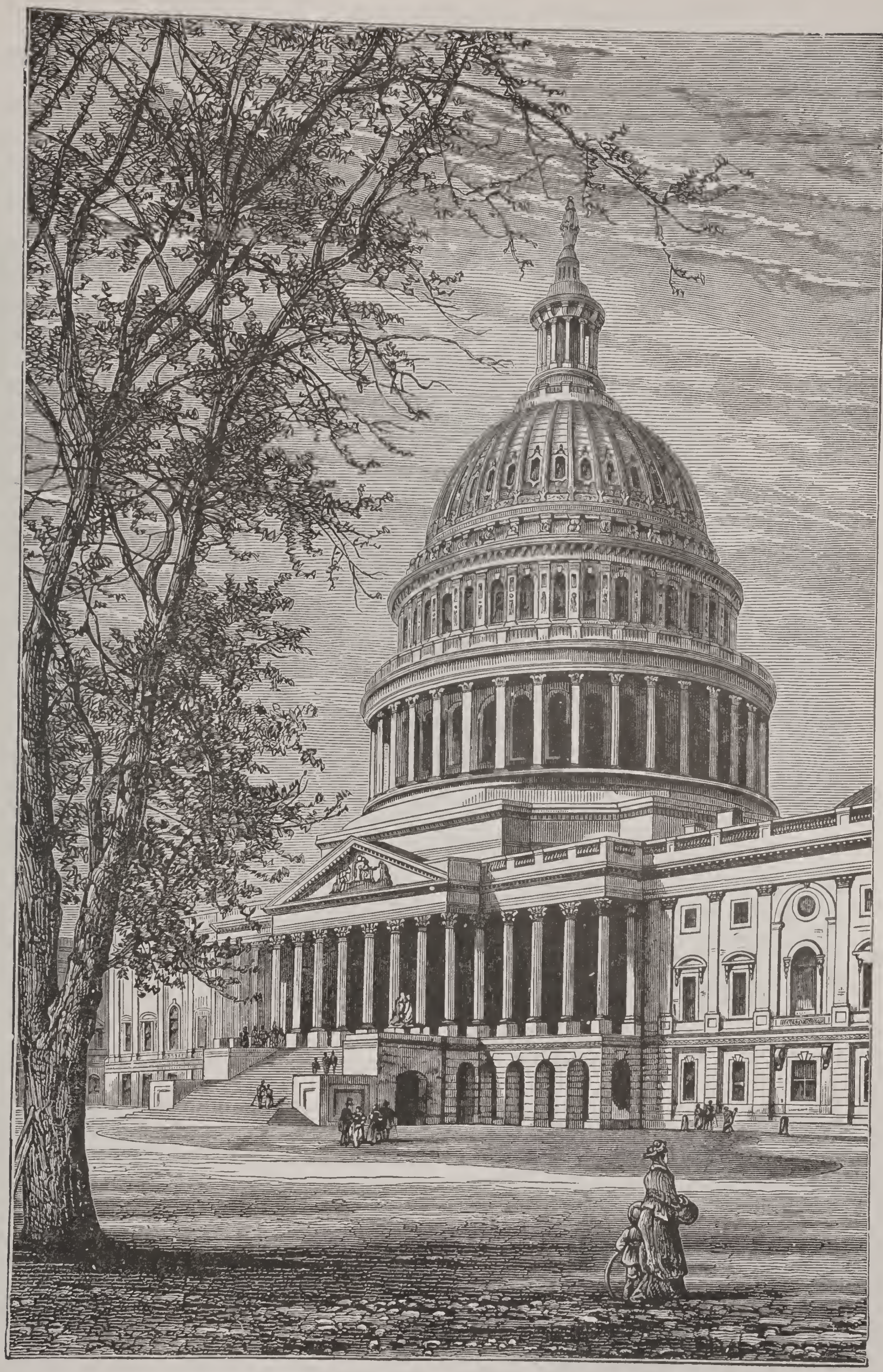
spent on each volume, or 27 cents on each reader; in Columbia College Library, 21½ cents per reader; in the Library Company of Philadelphia, 26 cents per volume, or 10 cents per head. The largest library in the world is the National Library of France, founded by Louis XIV., which now contains 1,400,000 books, 300,000 pamphlets, 175,000 manuscripts, 300,000 maps and charts, 150,000 coins and medals, 1,300,000 engravings and 100,000 portraits. The Library of Congress is the largest in this country.

MOST EXTENSIVE MINES in the world are those of Freiberg, Saxony. They were begun in the twelfth century, and in 1835 the galleries, taken collectively, had reached the unprecedented length of 123 miles. A new gallery, begun in 1838, had reached a length of twelve miles at the time of the census of 1895. The deepest perpendicular mining shaft in the world is located at Prizilram, Bohemia. It is a lead mine, 3280 feet deep. The deepest coal mine in the world is near Tourney, Belgium; it is 3542 feet in depth, but, unlike the lead mine mentioned above, it is not perpendicular. The deepest hole ever bored into the earth is the artesian well at Potsdam, which is 5,500 feet in depth. The deepest coal shaft in the United States is located at Pottsville, Pa., 1800 feet. From this great depth 400 cars, holding four tons each, are hoisted daily. The deepest silver mine in the United States is the Yellow Jacket, one of the great Comstock system at Virginia City, Nevada; the lower levels are 2700 feet below the hoisting works.

LARGEST STONE BRIDGE on the face of the earth is that finished in May, 1885, at Lagang, China. Chinese engineers had sole control of its construction. It crosses an arm of the China Sea, is nearly six miles in length, is composed entirely of stone, and has 300 arches, each 70 feet high. It is the most colossal structure ever reared by man, yet we sneer at "heathen Chinee." The largest truss iron bridge in the world crosses the Firth of Tay, Scotland. It is 18,612 feet in length and composed of 85 spans. The longest wooden bridge in the world is that crossing Lake Ponchartrain, near New Orleans, La. It is a trestle-work 21 miles in length, built of cypress piles which have been saturated with creosote oil to preserve them. The highest bridge in the United States is over Kinzina Creek, near Bradford, Pa. It was built in 1882, has a total span of 2,051 feet and is 301 feet above the creek bed.

"CENTENNIAL OX," bred by Samuel Barkley of Somerset County, Pa., was the largest specimen of the bovine the world has ever seen. He weighed 4900 pounds the day he arrived in Philadelphia. This mountain of beef was of mixed stock, being short-horn, native "scrub," and Ayrshire, the short-horn predominating. After the exhibition was ended the giant ox was butchered and exhibited as "show beef" at Philadelphia during the holidays of 1876. A short-horn steer weighing 4100 pounds was slaughtered at Detroit in 1874. A. M. Meal, of Moberly, Mo., formerly owned the largest cow in the world. Mr. Meal disposed of her in 1883, the Cole Circus Company being the purchasers She weighed the day of sale 3296 pounds. Mr. John Pratt, of Chase County, Kan., was formerly the owner of a cow weighing 3200 pounds. She was of the common "scrub" stock and stood nineteen hands high.

GREAT PYRAMID OF CHEOPS is the largest structure of any kind ever erected by the hand of man. Its original dimensions at the base were 762 feet square, and its perpendicular height in the highest point 486 feet; it covers four acres, one rood, and

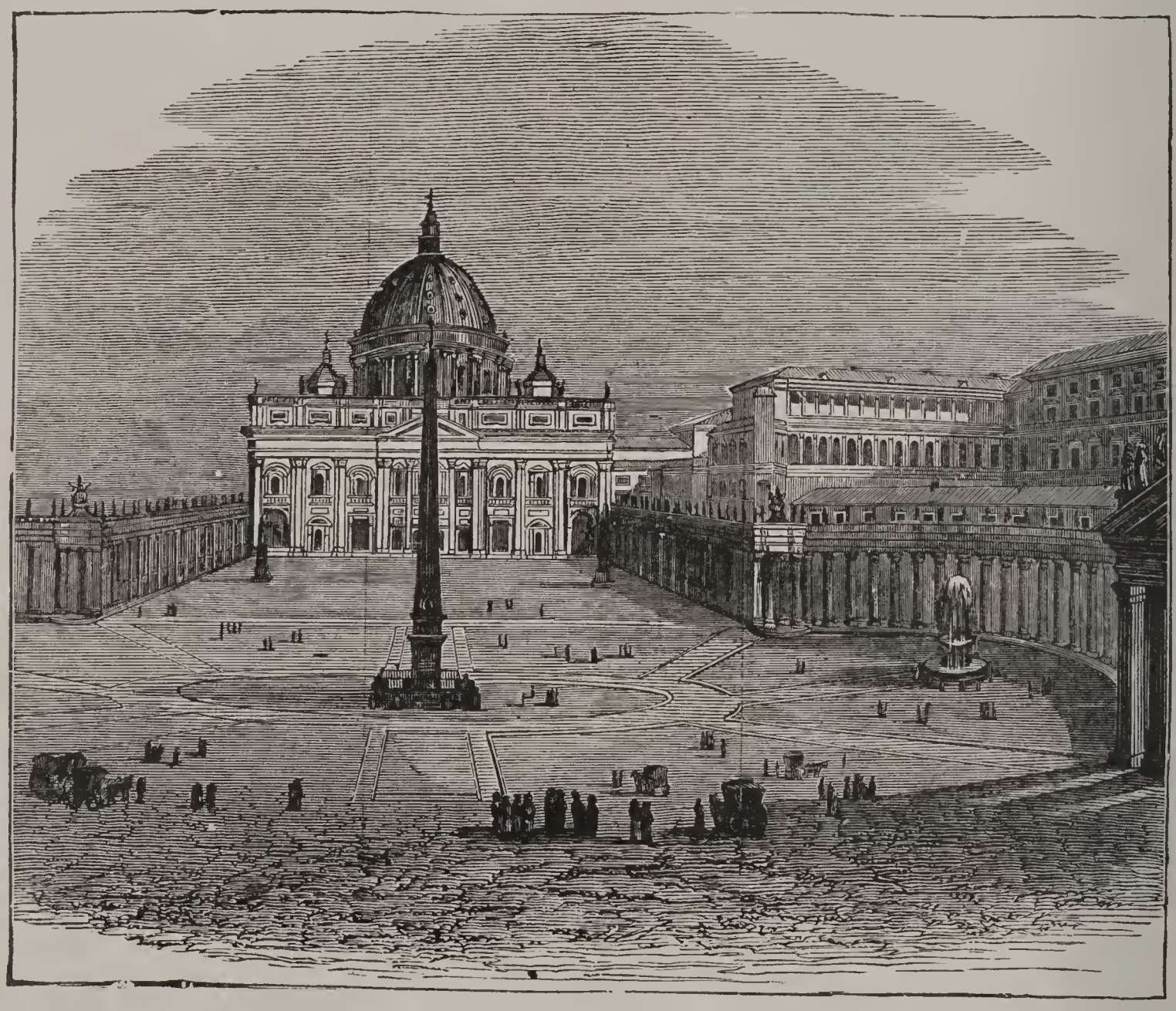


VIEW OF THE NATIONAL CAPITOL AT WASHINGTON.

twenty-two perches of ground, and has been estimated by an eminent English architect to have cost not less than £30,000,000, which in United States currency would be about $147,200,000. Internal evidence proves that the great pyramid was begun about the year 2170 B. C., about the time of the birth of Abraham. It is estimated that about 5,000,000 tons of hewn stone were used in its construction, and the evidence points to the fact that these stones were brought a distance of about 700 miles from quaries in Arabia.

LARGEST AND GRANDEST TEMPLE OF WORSHIP in the world is the St. Peter's Cathedral at Rome. It stands on the site of Nero's circus, in the northwest part of the city, and is built in form of a Latin cross. The total length of the interior is 612½ English feet; transept, 446½ feet; height of nave, 152½ feet; diameter of cupalo, 193 feet; height of dome from pavement to top of cross, 448 feet. The great bell alone without the hammer or clapper weighs 18,600 pounds, or over 9¼ tons. The foundation was laid in 1450 A. D. Forty-three Popes lived and died during the time the work was in progress. It was dedicated in the year 1826, but not entirely finished until the year 1880. The cost, in round numbers, is set down as $70,000,000.

CAPITOL BUILDING at Washington, D. C., is the largest building in the United States. The corner stone was laid December 18, 1793, by President Washington, assisted by other Masons. It was partially destroyed by the British in 1814. The present dome was begun in 1855 and finished in 1863. The flag of the United States first floated from it December 12, 1863. The cost of the entire building has been something over $13,000,000. Its length is 715 feet 4 inches; width, 324 feet. It covers 3½ acres of ground. The distance from the ground to the top of the dome is 307½ feet; diameter of the dome, 135½ feet—making fifth as to size with the greatest domes of the world.



ST. PETER'S AND THE VATICAN, ROME.

LARGEST AND COSTLIEST PRIVATE MANSION in the world is that belonging to Lord Bute, called Montstuart, and situated near Rothesay, England It covers nearly two acres; is built in gothic style; the walls, turrets and balconies are built of stone. The immense tower in the center of the building is 120 feet high, with a balcony around the top. The halls are constructed entirely of marble and alabaster,

and the rooms are finished in mahogany, rosewood and walnut. The fire-places are all carved marbles of antique design. The exact cost of this fairy palace is not known, but it has never been estimated at less than $8,000,000.

LARGEST BODY OF FRESH WATER in the world is Lake Superior. It is 400 miles long and 180 miles wide; its circumference, including the windings of its various bays, has been estimated at 1800 miles. Its area in square miles is 32,000, which is greater than the whole of New England, leaving out Maine. The greatest depth of this inland sea is 200 fathoms, or 1200 feet. Its average depth is about 160 fathoms. It is 636 feet above sea level.

FAMOUS CORLISS ENGINE, the largest ever constructed, and the one used to drive the machinery in the great hall at the Centennial of 1876, is now in the shops of the Pullman Car Company at Pullman, near Chicago, Ill. The writer is aware that this differs from other statements that have been made, it being generally supposed that the Emperor of Brazil bought the engine and removed it to his own country. He did talk of buying it, but the bargain was never consummated. This tireless giant works in an upright position, is over 40 feet high, of 1400 horse-power, and has two 40-inch cylinders and a 10-foot stroke.

LARGEST FERRY-BOAT ever constructed was named the Solano, and is now in use daily conveying trains across the Straits of Carquinez, between Benecia and Port Costa. The Solano is 460 feet long, 116 feet wide, and 20-foot depth of hold. She has 8 steel boilers, 4 rudders and a tonage of 3841 tons. On her decks are 4 railway tracks, with capacity for 48 ordinary freight cars and 2 locomotives, or 28 passenger coaches of the largest build.

HIGHEST BUILDING in the world, not counting the Eiffel Tower, the Washington Monument and the City Hall, Philadelphia, is the Cologne Cathedral. The height from the pavement to the top of the cupola is 511 feet. It is 511 feet long, exactly the same as the height, and 231 feet wide. It was begun August 15th in the year 1248, and was pronounced finished August 14, 1880, over 600 years after the corner-stone was laid.

HIGHEST MOUNTAIN on the globe is not, as is generally supposed, Mt. Everest, that honor belonging to a lofty peak named Mt. Hercules on the Isle of Papua, New Guinea, discovered by Capt. Lawson in 1881. According to Lawson, this monster is 32,763 feet in height, being 3781 feet higher than Mt. Everest, which is only 29,002 feet above the level of the Indian Ocean.

LARGEST STATE in our grand republic is Texas, which contains 274,356 square miles, capable of sustaining 20,000,000 of people, and then it would not be more crowded than Scotland is at present. It has been estimated that the entire population of the globe could be seated upon chairs within the boundary of Texas, and each have four feet of elbow room.

MISSISSIPPI RIVER, from the source of the Missouri to the Eads jetties, is the LONGEST RIVER in the world. It is 4300 miles in length and drains an area of 1,726,000 square miles. The Amazon, which is, without doubt, the widest river in the world, including the Beni, is 4000 miles in length and drains 2,330,000 square miles of territory.

LARGEST CUSTOM-HOUSE in this or any other land is in New Orleans. It was begun in 1848 and over thirty years elapsed before it was finished and ready for use. It is built of Quincy granite, the interior being finished in finest marble. It has 111 rooms; height from the pavement to the top of the cornice is 80 feet, and to the top of the light on the dome 187 feet. The dome itself is 49 feet square and 61 feet high; estimated total cost of building, $4,900,000.

LARGEST HOTEL in the United States, and probably the largest in the world, is located at San Francisco, Cal. It is 9 stories high and cost $3,500,000. It is named the Palace, and has accommodations for 1,500 guests.

FINEST THEATRE in the world is in Paris. It is of solid stone, finished with marble floors, and covers about four acres of ground. La Scala, of Milan, has the largest seating capacity, while the Auditorium at Chicago, completed in 1889, seating 7000 people, ranks second in that respect.

A BLOCK OF COAL exhibited at the Iowa State Fair is thought to be the largest even mined; it weighed 7000 pounds.

LARGEST BOUND BOOK ever made is owned by Queen Victoria. It is 18 inches thick and weighs 63 pounds. It contains the jubilee addresses of congratulation.

LARGEST COAL BREAKER in the world is in operation at Edwardsville Colliery, Luzerne County, Pa. It prepares for market 4000 mine cars of coal every ten hours.

GREATEST ELEVATION ever attained by balloonists was 37,000 feet—about 7 miles. The aeronauts were James Glaisher, F. R. S., and Mr. Coxwell. The ascent was made September 5, 1862, at Wolverhampton, England.

LONGEST SINGLE SPAN OF WIRE in the world is used for a telegraph in India. It is stretched over the River Kistuah, between Bezorah and Sectauagrum. It is over 6000 feet long, and is stretched from the top of one mountain to the top of another, each mountain being nearly 2000 feet high.

TWO LARGEST CASTINGS in the world are in Japan, one at Nara and the other at Kamakura. Both are statues. The one at Nara is 53 feet and 9 inches from the base to the crown of the head. It was first cast in the eighth century, but was afterward destroyed and recast in the year 1223. The Kamakura statue is 47 feet high.

SYDNEY (Australia) LIGHTHOUSE is provided with the largest electric light in the world. It has a power of 180,000 candles and may be seen from ships 50 miles at sea. The next largest is in the Palais d'Industrie and has a power of 150,000 candles. San Jose, California, has the most powerful electric light in the United States, one of 24,000 candle power.

STONE PAVEMENT in front of the residence of the late William H. Vanderbilt, in New York City, is made up of the largest slabs of flagging stone ever put in a single pavement. The stones were taken from quarries in Pike County, Pennsylvania, west of Port Jervis, N. Y., and from the Bigelow quarries in Ulster County, N. Y. The large slab immediately in front of the residence is the largest slab of its kind ever transported from any quarry and cost the millionaire $9200; the entire cost of the pavement was $47,000.

GREATEST INDIVIDUAL LAND PROPRIETOR in the world is Wilson Waddingham, who in 1887 purchased 163,000 acres of land in San Miguel County, New Mexico. His present landed interests amount to 1,500,000 acres, about 500,000 acres more than are claimed for the Duke of Westminster. In 1896 the largest producing farm in the world was one of the same number of acres (1,500,000) situated in the sonthwest corner of Louisiana. This immense farm is operated by a northern syndicate, with J. B. Watkins as manager.

GREATEST FORTRESS, from a strategical point of view, is the famous stronghold of Gibraltar. It occupies a rocky peninsula jutting out into the sea, about three miles long and three-quarters of a mile wide. One central rock rises to a height of 1435 feet above the sea-level. Its northern face is almost perpendicular, while its east side is full of tremendous precipices. On the south it terminates in what is called Europa Point. The west side is less steep than the east, and between its base and the sea is the narrow, almost level span on which the town of Gibraltar is built. The fortress is considered impregnable to military assault. The regular garrison in time of peace numbers about 7000.

BIGGEST CAVERN is the Mammoth Cave, in Edmonson County, Kentucky. It is near Green River, about six miles from Cave City, and twenty-eight from Bowling Green. The cave consists of a succession of irregular chambers, some of which are large, situated on different levels. Some of these are traversed by the navigable branches of the subterranean Echo River. Blind fish are found in its waters.

LARGEST HANGING BELL IN THE WORLD is in a Buddhist monastery, near Canton, China. It is eighteen feet high and forty-five feet in circumference, and is of solid bronze. It is one of the eight great bells which were cast by command of the Emperor Yung-lo about A. D. 1400, and is said to have cost the lives of eight men, who were killed during the process of casting. The whole bell, both inside and out, is covered with an inscription in embossed Chinese characters about half an inch long, covering even the handle, the total number being 84,000. The characters tell a single story—one of the Chinese classics.

LARGEST STATIONERY ENGINE IN THE WORLD is at the famous zinc mines at Friedensville, Pa. It is known as the "President," and there is no pumping engine in the world that can be compared with the monster. The number of gallons of water raised every minute is 17,500. The driving wheels are thirty-five feet in diameter and weigh forty tons each. The sweep rod is forty feet long, the cylinder 110 inches in diameter, and a piston-rod eighteen inches in diameter, with a ten-foot stroke.

LARGEST GUN IN THE UNITED STATES is the 20-inch Rodman, smooth bore, at Fort Hamilton, New York Harbor. Its dimensions are as follows: Extreme length, 243⅝ inches; maximum diameter, 64 inches; minimum diameter, 34 inches; length of bore in calibers, 10.50 inches. The service charge is 200 pounds of powder, and the weight of the projectile is 2000 pounds. There is also a wrought iron lined rifled 12½ inch gun at Sandy Hook. Its weight is 89,350 pounds; extreme length, 262⅔ inches; maximum diameter, 55 inches; minimum diameter, 27.55 inches; length of the bore in calibers, 18.53 inches. The gun is used for experimental purposes in testing powder.

The Longest Tunnels in the World.

MOUNT ST. GOTHARD TUNNEL, Italy, is 48,840 feet long, or nearly ten miles long, and the longest in the world.

MOUNT CENIS TUNNEL, Italy, is 39,840 feet long, or about seven miles long.

HOOSAC TUNNEL, Massachusetts, is 25,031 feet long, or about four and one-half miles.

NOCHISTONGO TUNNEL is 21,659 feet long or about four miles.

SUTRO TUNNEL is 20,028 feet long, or four miles.

THAMES AND MEDWAY, England, is 11,880 feet long, or about two miles.

LARGEST PILLARS IN THE WORLD—RUINS OF KARNAK, EGYPT.

Largest Steam Hammer in the World.

The greatest steam hammer in the world, constructed at the Bethlehem Iron Company's works for the manufacture of armor plate, was designed after the hammer of Schneider & Co., of Le Crusot, France, which, next to this one, is the largest hammer in the world. It has a stroke of 125 tons, while the Schneider hammer is only capable of striking a 100-ton blow. The hammer is used for forging ingots into armor plates. These ingots are cast of metal weighing from 100 to 150 tons, and by this stupendous piece of mechanism are forged into the desired sizes by 125-ton blows.

The hammer stands in the centre of a very large building and over a year was spent in its construction. A pit 58 by 62 feet was dug for the foundation and on walls 30 feet high the anvil stands. To give the foundation a certain elasticity a layer of 20 steel slabs on top of Ohio white oak timbers was made and the surface was rendered perfectly smooth. It was of course entirely out of the question to cast in a single piece the iron required and the anvil was built by depositing on top of the steel slabs and their timbers 22 blocks of solid cast iron. The average weight of these blocks is 70 tons, and the entire weight of the mass of iron and steel forming the anvil and foundation is nearly 1800 tons.

The hammer itself is a majestic looking structure, superimposed over the cyclopean mass of iron, forming the anvil—huge, substantial and powerful, rising to a height of 90 feet.

Most Notable Bridges of the World.

BROOKLYN BRIDGE was Commenced, under the direction of J. Roebling, in 1870, and completed in about thirteen years. The cost of building was nearly $15,000,000. (The dimensions are given elsewhere.)

CANTILEVER BRIDGE, over the Niagara, is built almost entirely of steel. Its length is 910 feet, the total weight is 3000 tons, and the cost was $900,000.

FIRST NIAGARA SUSPENSION BRIDGE was built by Roebling in 1852–53, at a cost of $400,000. It is 245 feet above water, 821 feet long, and the strength is estimated at 1200 tons.

BRIDGE AT HAVRE DE GRACE, over the Susquehanna, is 3271 feet long, and is divided into twelve wooden spans, resting on granite piers.

BRITANNIA BRIDGE crosses the Menai strait, Wales, at an elevation of 103 feet above high water. It is of wrought iron, 1511 feet long, and was finished in 1850. Cost, $3,008,000.

NEW LONDON BRIDGE is constructed of granite, from the designs of L. Rennier. It was commenced in 1824, and completed in about seven years, at a cost of $7,291,000.

OLD LONDON BRIDGE was the first stone bridge. It was commenced in 1176 and completed in 1209. Its founder, Peter of Colechurch, was buried in the crypt of the chapel erected on the centre pier.

COALBROOKDALE BRIDGE, England, is the first cast-iron bridge. It was built over the Severn in 1779.

BRIDGE AT BURTON, over the Trent, was formerly the longest bridge in England, being 1545 feet. It is now partly removed. Built in the twelfth century.

THE RIALTO, at Venice, is said to have been built from the designs of Michael Angelo. It is a single marble arch, 98½ feet long, and was completed in 1591.

BRIDGE OF SIGHS, at Venice, over which condemned prisoners were transported from the hall of judgment to the place of execution, was built in 1589.

BRIDGE OF THE HOLY TRINITY, at Florence, was built in 1569. It is 322 feet long, constructed of white marble, and stands unrivaled as a work of art.

COVERED BRIDGE AT PAVIA, over the Ticino, was built in the fourteenth century. The roof is held by 100 granite columns.

ST. LOUIS BRIDGE, over the Mississippi, is 1524 feet long, exclusive of approaches. There are three arched spans of cast steel, the centre arch being 520 feet, with a rise of 47½ feet; and the side spans 502 feet each, with a rise of 46 feet. The width on top, between rails, is 50 feet. The piers rest on the bedrock of the river, 136 feet below high water mark. Captain James B Eads was the engineer.

RUSH STREET BRIDGE, Chicago, Ill., erected in 1884, at a cost of $132,000 is the largest general traffic drawbridge in the world. Its roadway will accomdate four teams abreast, and its footways are seven feet wide.

VICTORIA BRIDGE, Montreal, one of the most famous in the world, is nearly two miles in length.

CLEVELAND (O.) VIADUCT is 3211 feet in length, 64 feet wide, 42 feet of which is roadway; the drawbridge is 332 feet in length, 46 feet wide, and is 68 feet above ordinary stage of water.

The Greatest City in the World.

London, England, is the greatest city the world ever saw. It covers within the fifteen miles radius of Charing Cross (Strand) 700 miles. It numbers within these boundaries 5,656,000 of inhabitants. It comprises over 2,000,000 foreigners from every quarter of the globe. It contains more Roman Catholics than Rome itself; more Jews than the

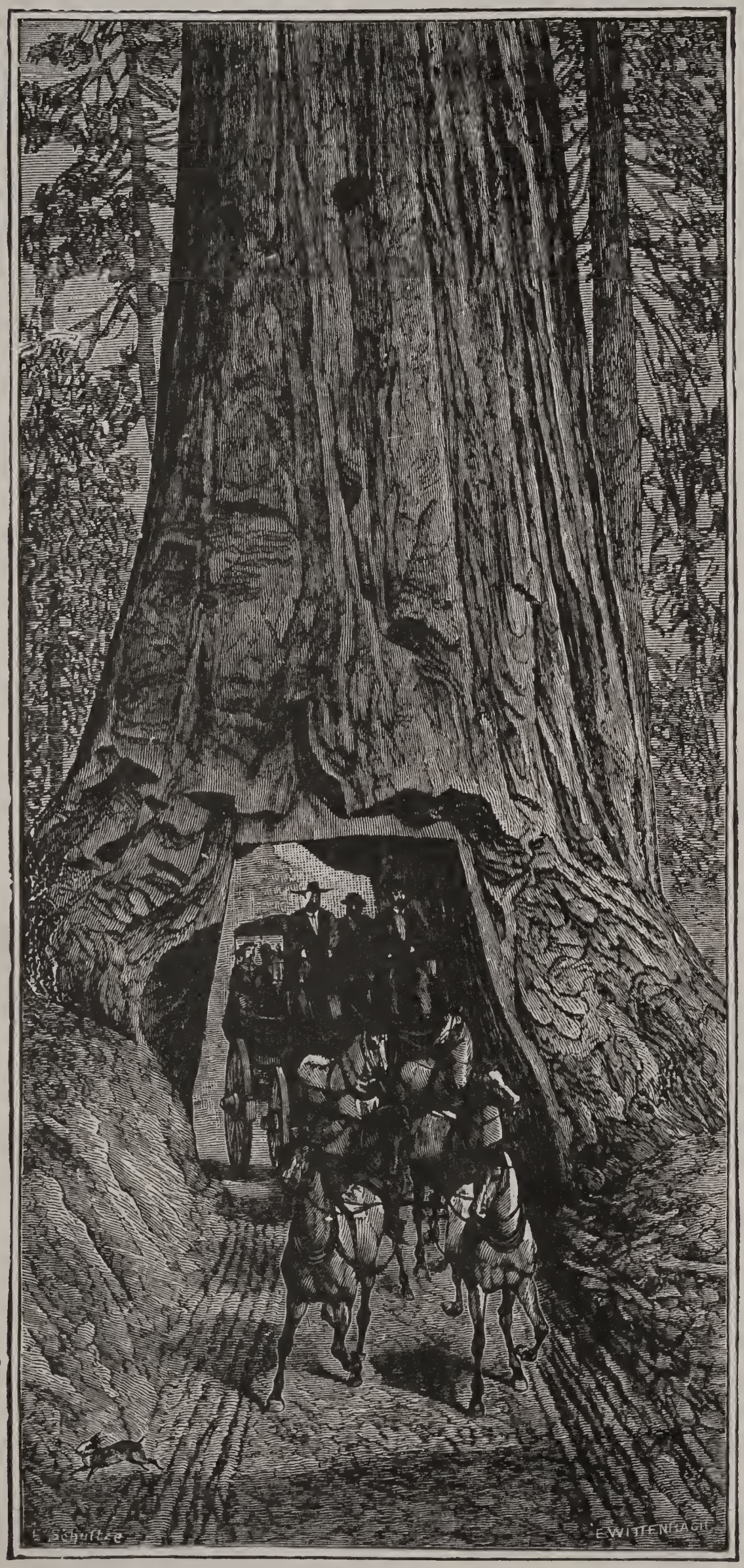
whole of Palestine; more Irish than Dublin; more Scotchmen than Edinburgh; more Welshmen than Cardiff; more country-raised persons than the counties of Devon, Warwickshire and Durham combined.

London has 49,000 persons added annually (by birth) to its population; has over 1000 ships and 10,000 sailors in its port every day; has as many beer shops and gin palaces as would, if placed side

THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.

Has a birth every five minutes, has a death in it every eight minutes; has seven accidents every day in its 8000 miles of streets; has on an average 40 miles of streets opened and 15,000 new houses built in every year.

by side, stretch from Charing Cross to Portsmouth, a distance of seventy-eight miles; has 38,000 drunkards annually brought before its magistrates; has seventy miles of open shops every Sunday; has influence with all parts of the world represented by



ONE OF THE BIG TREES OF CALIFORNIA.

a yearly delivery in its postal districts of 298,000,000 of letters. Eight hundred and fifty trains pass Clapham junction every day, and the transportation (underground) railroad runs 1211 trains every day.

The London Omnibus Company have over 700 'busses, which carry 56,000,000 passengers annually. It is more dangerous to walk the streets of London than to travel by railroad or to cross the Atlantic from New York to Liverpool. In 1886, 130 persons were killed and 2000 injured by vehicles in the streets. There are in London 15,000 police, 15,000 cabmen, 15,000 persons connected with the post-office. The cost of gas for lighting London annually is $3,000,000. London has 400 daily and weekly newspapers. The ancient city of London was first founded by Brute, the Trojan, in the year of the world 2832, so that since the first building it is 3007 years old. The drainage system of London is superb, and the death rate very low.

The Largest Trees in the World.

The big trees of Calaveras and Mariposa Counties, in California, belong to the same genus as the common redwood. This giant of the Sierras is not a handsome tree, either when young or aged; the branches are short, the spray less graceful than the coast redwood, the leaves small and awl-shaped, but the cones are several times larger, and the wood is of a duller reddish hue. The forests were first seen by white men in the spring of 1852, when a hunter named Dowd conducted a party of miners to the locality where the big trees grew. In the several groves where they have been found, there are many trees from 275 to 335 feet high, and from 25 to 34 feet in diameter. The area of Mariposa Grove is two miles square, and it contains 427 of the monster trees.

The largest in the Calaveras Grove is "The Keystone State," and is 325 feet high, and its girth six feet from the ground is 45 feet. There are some in the Mariposa Grove which are not so high, but which have a greater circum-

ference. "The Grizzly Gian," for example, being 93 feet at the ground, and over 64, eleven feet above. Some dozen miles south of the Mariposa Grove is the Fresno Grove, which is said to contain about 600 trees, the largest 81 feet in circumference; while about fifty miles north of the Calaveras, in Placer county, a small grove has been discovered. Careful computations have been made of the ages of these trees, and some cautious scientists admit, in regard to one of them, that "its age cannot have exceeded 1300 years!"

The Largest Park in the World.

The Yellowstone National Park extends sixty-five miles north and south and fifty-five miles east and west, comprising 3575 square miles, and is 6000 feet or more above sea level. Yellowstone Lake, twenty miles by fifteen, has an altitude of 7788 feet. The mountain ranges which hem in the valleys on every side rise to the height of 10,000 to 12,000 feet, and are always covered with snow. This great park contains the most striking of all the mountains, gorges, falls, rivers and lakes in the whole Yellowstone region.

The springs on Gardiner's River cover an area of about one square mile, and three or four square miles thereabout are occupied by the remains of springs which have ceased to flow. The natural basins into which these springs flow are from four to six feet in diameter and from one to four feet in depth. The principal ones are located upon terraces midway up the sides of the mountain. The banks of the Yellowstone River abound with ravines and canyons, which are carved out of the heart of the mountains through the hardest rocks.

The most remarkable of these is the canyon of Tower Creek and Column Mountain. The latter, which extends along the eastern bank of the river for upward of two miles, is said to resemble the Giant's Causeway. The canyon of Tower Creek is about ten miles in length, and is so deep and gloomy that it is called "The Devil's Den." Where Tower Creek ends the Grand Canyon begins. It is twenty miles in length, impassable throughout, and inaccessible at the water's edge, except at a few points. Its rugged edges are from 200 to 500 yards apart, and its depth is so profound that no sound ever reaches the ear from the bottom.

The Grand Canyon contains a great multitude of hot springs of sulphur, sulphate of copper, alum, etc. In the number and magnitude of its hot springs and geysers, the Yellowstone Park surpasses all the rest of the world. There are probably fifty geysers that throw a column of water to the height of from 50 to 200 feet, and it is stated that there are not fewer than 5000 springs.

The temperature of the calcareous springs is from 160 to 170 degrees, while that of the others rises to 200 or more. The principal collections are the upper and lower geyser basins of the Madison River and the calcareous springs on Gardiner's River. The great falls are marvels to which adventurous travelers have gone only to return and report that they are parts of the wonders of this new American wonderland.

The Washington Monument.

The corner-stone was laid by President Polk, July 4, 1848, and December 6, 1884, the cap-stone was set in position. The foundations are 126½ feet square and 36 feet 8 inches deep. The base of the monument is 55 feet 1½ inches square, and the walls 15 feet ¼ inch thick. At the 500-foot mark, where the pyramidal top begins, the shaft is 34 feet 5½ inches. square and the walls are 18 inches thick.

The monument is made of blocks of marble 2 feet thick, and it is said there are over 18,000 of them. The height above the ground is 555 feet. The pyramidal top terminates in an aluminum tip, which is 9 inches high and weighs 100 ounces. The mean pressure of the monument is 5 tons per square foot, and the total weight, foundation and all, is nearly 81,000 tons. The door at the base, facing the capitol, is 8 feet wide and 16 feet high, and enters a room 25 feet square.

An immense iron frame-work supports the machinery of the elevator, which is hoisted with steel wire ropes, 2 inches thick. At one side begin the stairs, of which there are 50 flights, containing 18 steps each. Five hundred and twenty feet from the base there are 8 windows, 18x24 inches, 2 on each face. The area at the base of the pyramidal top is 1187¼ feet, space enough for a six-room house, each room to be 12x16 feet. The Cologne Cathedral is 511 feet high; the pyramid of Cheops, 486; Strasburg Cathedral, 474; St. Peter's at Rome, 448; the Capitol at Washington, 306, and Bunker Hill Monument, 221 feet. The Washington Monument, therefore, is the highest structure in the world, except the temporary Eiffel Tower. The total cost was not far from $1,500,000.

Height of Principal Monuments and Buildings.

Places.	Names.	Feet.
Paris	Eiffel	1000
Wash., D. C	Washington Monument	555
Philadelphia	Public Buildings	545
Egypt	Pyramid of Cheops	486
Belgium	Antwerp Cathedral	476
France	Strasburg Cathedral	474
Egypt	Pyramid of Cephrenes	456
Rome	St. Peter's Church	448

Places.	Names.	Feet.
Germany	St. Martin's Church at Landshut.	411
England	Salisbury Cathedral	400
England	St. Paul's Church, London	365
Italy	Cathedral at Florence	386
Lombardy	Cathedral at Cremona	397
Germany	Church at Fribourg	386
Spain	Cathedral of Seville	360
Lombardy	Cathedral of Milan	355
Holland	Cathedral of Utrecht	356
New York	Trinity Church	284
China	Porcelain Tower, Nankin	260
Paris	Church of Notre Dame	224
Massachusetts.	Bunker Hill Monument	221
Italy	Leaning Tower of Pisa	179
Baltimore	Washington Monument	175
Paris	Monument, Place Vendome	153
Italy	Trojan's Pillar, Rome	151
Paris.	Obelisk of Luxor	110

Capacity of the Largest Churches and Hall

St. Peter's Cathedral	Rome	54,000
Cathedral of Milan	Milan	37,000
St. Paul's Church	Rome	32,000
St. Paul's Cathedral	London	25,000
Church of St. Petronio.	Bologna	24,000
Cathedral of Florence	Florence	24,000
Cathedral of Antwerp	Antwerp	24,000
Mosque of St. Sophia	Constantinople	23,000
St. John's Lateran	Rome	22,000
Cathedral of Notre Dame	Paris	21,000
Cathedral of Pisa	Pisa	13,000
Church of St. Stephen.	Vienna	12,000
Church of St. Dominic.	Bologna	12,000
Church of St. Peter	Bologna	11,400
Cathedral of Vienna	Vienna	11,000
St. Peter's Cathedral	Montreal	10,000
Auditorium	Chicago	8,000

The Highest Mountains.

	Feet.
Kunchainyunga, Himalayas	28,170
Sorata, Andes	25,380
Illimani, Bolivia	21,780
Chimborazo, Ecuador	21,444
Hindoo-Koosh, Afghanistan	20,600
Cotopaxi, Ecuador	19,408
Antisana, Ecuador	19,150
St. Elias, British America	18,000
Popocatapetl, Mexico	17,735
Mt. Roa, Hawaii	16,000
Mt. Brown	15,900
Mont Blac	15,776
Mowna Roas, Owhyhee	15,700
Mt. Rosa, Alps, Sardinia	15,550
Pinchinca, Ecuador	15,200
Mt. Whitney, California	15,000
Mt. Fairweather, Alaska	14,796
Mt. Shasta, California	14,450
Pike's Peak, Colorado	14,320
Mt. Ophir, Sumatra	13,800
Fremont's Peak, Wyoming	13,570
Long's Peak, California	13,400
Mt. Ranier, Washington	13,000
Mt. Ararat, Armenia	12,700
Peak of Teneriffe, Canaries	12,236
Miltsin, Morocco	12,00.
Mt. Hood, Oregon	11,570
Simplon, Alps	11,542
Mt. Lebanon, Syria	11,000
Mt. Perdu, France	10,950
Mt. St. Helen's, Oregon	10,158
Mt. Etna, Sicily	10,050
Olympus, Greece	9,754
St. Gothard, Alps	9,080
Mt. Sinai, Arabia	8,000
Pindus, Greece	7,677
Black Mountain, New Caledonia	6,467
Mt. Washington, New Hampshire	6,234
Mt. Marcy, New York	5,467
Mt. Hecla, Iceland	5,000
Ben Nevis, Scotland	4,40[illegible]
Mansfield, Vermont	4,2[illegible]
Peaks of Otter, Virginia	4,26[illegible]
Ben Lawers, Scotland	4,030
Parnassus, Greece	3,850
Vesuvius, Naples	3,93
Ben Lomond, Scotland	3,28[illegible]
Mt. Carmel	2,000

Height of Twenty-four of the Loftiest Volcanoes of the World.

Name of Volcano.	Height in feet.	Where Located.
Sahama	23,000	Peru.
Llullaillac	21,000	Chili.
Arequipa	20,500	Peru.
Cayambi	19,813	Equador
Cotopaxi	19,500	Peru.
Antisana	19,200	Ecuador.
San Jose	18,150	Chili.
Mt. St. Elias	17,900	Alaska.
Popocatepetl	17,884	Mexico.
Orizaba	17,370	Mexico.
Altar	17,126	Ecuador.
Sangai	17,120	Ecuador.
Klintcheoskaia	16,512	Kamtschatka.
Iztacihuate	15,700	Mexico.
Toluco	15,500	Mexico.
Shasta	14,400	United States

Name of Volcano.	Height in feet.	Where Located.
Fujiyama	14,000	Japan.
Mauna Kea	13,953	Sandwich Islands.
Mauna Loa	13,760	Sandwich Islands.
Teneriffe	12,236	Canary Islands.
Mt. St. Helens	12,000	United States.
Mt. Hood	11,225	United States.
Peak of Tahiti	10,895	Friendly Islands.
Mt. Etna	10,874	Sicily.

Three of the best known volcanoes of the world, Vesuvius, 3978 feet; Hecla, 3970 feet, and Stromboli, 3000 feet, are of much less elevation than many others altogether unfamiliar.

Greatest Known Depth of the Ocean.

The greatest depth which has been ascertained by sounding is five miles and a quarter (25,720 feet, or 4620 fathoms), not quite equal to the height of the highest known mountain. The average depth between 60 degrees north and 60 degrees south is nearly three miles.

Deepest Lake in the World.

In the Cascade Mountains, about seventy-five miles northeast of Jacksonville, Ore., the seeker for the curious will find the Great Sunken Lake, the deepest lake in the world. This lake rivals the famous valley of Sinbad the Sailor. It is said to average 2000 feet down to the water on all its sides. The depth of the water is unknown, and its surface is as smooth and unruffled as a mammoth sheet of glass, it being so far below the mountain rim as to be unaffected by the strongest winds. It is about 15 miles in length and about 4½ wide.

For unknown ages it has lain still, silent and mysterious in the bosom of the great mountain range, like a gigantic trench scooped out by the hands of a giant genie. A hunting and surveying party recently left Jacksonville with the intention of ascertaining the exact depth of this mysterious body of water, and to find out, if possible, whether or not fish are to be found within its ghostly precincts.

The Longest Rivers in the World.

Name.	Miles.
EUROPE.	
Volga, Russia	2,500
Danube	1,800
Rhine	840
Vistula	700
ASIA.	
Yeneisy and Selenga	3,580
Kiang	3,290
Hoang Ho	3,040
Amoor	2,500
Euphrates	1,900
Ganges	1,850
Tigris	1,160
AFRICA.	
Nile	3,240
Niger	2,400
Gambia	1,000
SOUTH AMERICA.	
Amazon and Beni	4,000
Platte	2,700
Rio Madeira	2,300
Rio Negro	1,650
Orinoco	1,600
Uruguay	1,100
Magdalena	1,000
NORTH AMERICA.	
Mississippi and Missouri	4,300
Mackenzie	2,800
Rio Bravo	2,300
Arkansas	2,070
Red River	1,520
Ohio and Allegheny	1,480
St. Lawrence	1,450

Size of Lakes, Seas and Oceans

Lakes.	Miles Long.	Miles Wide.
Superior	380	120
Michigan	330	60
Ontario	180	40
Champlain	123	12
Erie	270	50
Huron	250	90
Cayuga	36	4
George	36	3
Baikal	360	35
Great Slave	300	45
Winnipeg	240	40
Athabasca	200	20
Maracaybo	150	60
Great Bear	150	40
Ladoga	125	75
Constance	45	10
Geneva	50	10
Lake of the Woods	70	25

Seas.	Miles Long.
Mediterranean	2,000
Carribbean	1,800
China	1,700
Red	1,400
Japan	1,000
Black	932

Seas.	Miles Long.
Caspian	640
Baltic	600
Okhotsk	600
White	450
Aral	250

Oceans.	Miles Square.
Pacific	80,000,000
Atlantic	40,000,000
Indian	20,000,000
Southern	10,000,000
Arctic	5,000,000

The Greatest Catastrophes of History.

In China, where some of the greatest rivers in the world flow between artificial banks at an elevation considerably above the surrounding country, there have been overflows that caused the destruction of hundreds of thousands of lives. There have been similar disasters in India, where, as in China, the rivers had made beds for themselves with alluvial banks higher than the plains across which they flowed. But aside from these the colossal calamity at Johnstown, Pa., in June, 1889, and through the fated Conemaugh Valley, leads all disasters in this country in the appalling muster roll of the dead, numbering over 6000. In past centuries the greatest loss of life has been by earthquake, and the following list embraces the loss in historic calamities :

Year.	Place.	Persons Killed.
1137	Sicily	15,000
1158	Syria	20,000
1268	Cilicia	50,000
1456	Naples	40,000
1531	Lisbon	40,000
1626	Naples	70,000
1667	Schamaki	80,000
1692	Jamaica	4,000
1693	Sicily	100,000
1703	Aquila, Italy	4,000
1703	Yeddo, Japan	200,000
1706	The Abruzzi	15,000
1716	Algiers	20,000
1726	Palermo	6,000
1731	Pekin	100,000
1746	Lima and Calloa	18,000
1754	Grand Cairo	40,000
1755	Kashan, Persia	40,000
1759	Syria	20,000
1784	Ezinghian, Asia Minor	5,000
1792	Country between Santa Fé and Panama	40,000
1805	Naples	6,500
1822	Aleppo	20,000
1829	Murcia	5,000
1830	Canton	6,000
1842	CapeHaytien	4,000
1857	Calabria	10,000
1859	Quito	5,000
1860	Mendozi, South America	7,000
1868	Towns in Peru and Ecuador	25,000
1875	San Jose de Cucuta, Colombia	14,000
1881	Scio	4,000
1886	Charleston	96

One instance shows how the human race has been depleted from this cause. In the Kingdom of Naples, from 1783 to 1857, a period of 75 years, the loss of life by earthquakes was 111,000 or at the rate of more than 1500 a year, out of a population of 6,000,000. The country surrounding the Mediterranean and the intertropical area from which the American Cordilleras spring, may be regarded as the centers of earthquake activity, though some of the greatest earthquakes of all time have occurred in Eastern Asia and the East Indies.

Floods and Freshets.

The list of losses by great floods and freshets in history is as follows :

Year.	Place.	Lives Lost.	Year.	Place.	Lives Lost
1871	China	3,000	1887	Yellow River China	100,000
1874	Mill River Mass	150	1889	Johnstown, Pa	6,111
1879	Marcia, Spain	1,000	1900	Galveston, Texas	5,000

Greatest Conflagrations of the Present Century.

But the greatest destruction of life and property by conflagrations, of which the world has anything like accurate records, must be looked for within the current century. Of these the following is a partial list of instances in which the loss of property amounted to $3,000,000 and upward :

Dates.	Cities.	Property Destroyed
1802	Liverpool	$ 5,000,000
1805	St. Thomas	30,000,000
1812	Moscow, burned five days ; 30,800 houses destroyed	150,000,000
1820	Savannah	4,000,000
1822	Canton, nearly destroyed	
1835	New York ("Great Fire")	15,000,000
1837	St. John, N. B.	5,000,000
1838	Charleston, 1158 buildings	3,000,000
1842	Hamburg, 4219 buildings, 100 lives lost	35,000,000
1845	New York, 35 persons killed	7,000,000
1845	Pittsburgh, 1100 buildings	10,000,000
1845	Quebec, May 28, 1650 dwellings	3,750,000
1846	St. Johns, Newfoundland	5.000,000
1848	Constantinople, 2500 buildings	15,000,000
1848	Albany, N. Y., 600 houses	3,000,000
1849	St. Louis.	3,000,000
1851	St. Louis, 2500 buildings	11,000,000
1751	St. Louis, 500 buildings	3,000,000
1851	San Prancisco, May 4 and 5, many lives lost	10,000,000
1851	San Francisco, June	3,000,000
1852	Montreal, 1200 buildings	5,000,000
1862	St. Petersburg	5,000,000

Dates.	Cities.	Property Destroyed.
1862	Troy, N. Y., nearly destroyed.....	
1865	Constantinople, 2800 buildings burned.....	
1866	Yokohama, nearly destroyed.....	
1865	Carlstadt, Sweden, all consumed but Bishop's residence, hospital, and jail; 10 lives lost.....	
1866	Portland, Me., half the city.....	$11,000,000
1866	Quebec, 2500 dwellings and 17 churches.....	
1870	Constantinople, Pera suburb.....	26,000,000
1871	Chicago, 250 lives lost, 17,430 buildings burned, on 2124 acres.....	192,000,000
1871	Paris, fired by the Commune.....	160,000,000
1872	Boston.....	75,000,000
1877	Pittsburgh, caused by riot.....	3,260,000
1877	St. Johns, N. B., 1650 dwellings, 18 lives lost.....	12,500,000
1889	Seattle, Wash.....	20,000,000

From the above it appears that the greatest fires on record, reckoned by destruction of property, are :

Chicago fire, of Oct. 8 and 9, 1871.....	$192,000,000
Paris fires, of May, 1871.....	160,000,000
Moscow fire, of Sept. 14–19, 1812.....	150,000,000
Boston fire, Nov. 9–10, 1872.....	75,000,000
Hamburg fire, May 5–7, 1842.....	35,000,000

Taking into account, with the fires of Paris and Chicago, the great Wisconsin and Michigan forest fires of 1871, in which it is estimated that 1000 human beings perished and property to the amount of over $3,000,000 was consumed, it is plain that in the annals of conflagrations that year stands forth in gloomy pre-eminence.

Chicago's Great Fires.

There were 2100 acres of land burned over, nearly all of which area was thickly covered with buildings. There were nearly 18,000 buildings destroyed, of which about 2400 were stores and factories; and there were but few short of 100,000 people rendered homeless by the calamity. The extreme length of the burnt district was 3¾ miles, and its greatest width a little over a mile. The fire of July, 1874, originated on South Clark street, between Taylor and Twelfth, and spread northeast to Michigan avenue. It was estimated that in this fire about fifty acres were burned over, many of the new buildings which had been erected after the great fire of 1871 having been leveled.

The loss of property in the great fire of 1871 was $192,000,000, after allowing $4,000,000 for salvage on foundations of buildings. This estimate does not include the shrinkage of real estate values, or the large loss to mercantile interests by the interruption of trade consequent upon the destruction of stocks and business facilities. Mr. Colbert estimated the grand aggregate not very much below $290,000,000.

The loss occasioned by the fire of 1874 was estimated as follows : The net loss to insurance companies was officially placed at $2,244,970, or 40 per cent. of the entire loss, making an estimated total loss of $5,612,425. The cash contributions to Chicago within three months after the fire amounted to $4,200,000.

Most Noted Facts in Turf History.

The richest stake ever run in America was the Futurity stake of 1890, run at Sheephead Bay, L. I., August 30, and won by August Belmont's ch. c. Potomac (2) by St. Blaise, dam Susquehanna, by Leamington. The value of the stake was $77,700, of which $68,450 went to the winner, and $4500 to the second horse, Masher, b. c., by Ill Used also owned by Mr. Belmont, who in addition received $2500 for breeding first and second, making his winnings $75,450. Stathmeath, the third horse, received $2250.

The Lancashire plate run at the Manchester, Eng., September meeting of 1889, and won by the Duke of Portland's b. c. Donovan, was worth nearly $80,000 to the winner.

Largest amount ever won by an American two-year-old, $78,650, Potomac, b. c., by St. Blaise, 1890.

The greatest winning three-year-old was Hanover, by Hindoo. He won twenty races and $89,827.

Miss Woodford, br. m., foaled 1880, by imported Billet, dam Fanny Jane, by Neil Robinson, won more money than any animal that ever ran on the American turf, winning in five years forty-eight races, worth $118,970.

In 1886 the stable of Dwyer Brothers won $208,549.16 in purses and stakes—more money than was ever won by any other single racing establishment in America.

The greatest sale of thoroughbreds ever had in this country was that of P. Lorillard in 1886, at which twenty-seven head sold for $149,050, the highest price being $29,000, the lowest $300.

King Thomas, by King Ban, was the highest priced yearling ever sold at auction, L. O. Appleby paying $38,000 for him at the Haggin sale in New York, June 25, 1888. The following day Mr. Appleby sold the colt to Senator Hearst, of California, for $40,000.

Highest price ever paid for a horse, $105,000, for Axtell, br. s., record, 2.12, three years old, by William L. (son of George Wilkes), dam Lou, by Mam-

brino Boy. Purchased from C. W. Williams, of Independence, Iowa, by John W. Conley, of Chicago, and others.

Dimensions of Bartholdi's Statue of Liberty.

The figure of this statue, which is made of repousse, or hammered work—that is, thin sheets of copper beaten into shape and fastened about an iron skeleton—is 110½ feet high and weighs 100,000 pounds. The uplifted torch, however, is raised 26 feet, and adding to this the pedestal, the tip of the torch is raised 220 feet from the ground. The pedestal is of stone, 82 feet high. Some idea of the enormous proportions of the statue may be given from the fact that the forefinger is 8 feet long, and 4 feet in circumference at the second joint. The head is 14 feet high and 40 persons can stand in it.

The Dimensions of the Great Wall of China, and of What it is Built.

It runs from a point on the Gulf of Liantung, an arm of the Gulf of Pechili in Northeastern China, westerly to the Yellow River, thence makes a great bend to the south for nearly 100 miles, and then runs to the northwest for several hundred miles to the Desert of Gobi. Its length is 1250 miles. For the most of this distance it runs through a mountainous country, keeping on the ridges, and winding over many of the highest peaks. In some places it is only a formidable rampart, but most of the way it is composed of lofty walls of masonry and concrete, or impacted lime and clay, 25 feet in thickness, and 25 feet in height.

The top of this wall is paved for hundreds of miles, and crowned with crenelated battlements, and towers 30 to 40 feet high. In numerous places the wall climbs such steep declivities that its top ascends from height to height in flights of granite steps. An army could march on the top of the wall for weeks and even months, moving in some places ten men abreast.

Most Northern Point Reached by Arctic Explorers.

The following table shows the furthest points of north latitude reached by Arctic explorers up to and including the Greely expedition:

Year.	Explorers.	North Latitudes.		
1607	Hudson	80d	23m	00s
1773	Phipps (Lord Musgrove)	80d	48m	00s
1806	Scoresby	81d	12m	42s
1827	Parry	82d	45m	30s
1874	Meyer (on land)	82d	09m	00s
1875	Markham (Nare's expedition)	83d	20m	26s
1876	Payer	83d	07m	00s
1884	Lockwood (Greely's party)	83d	24m	00s

The distance from the farthest point of polar discovery to the pole itself is 6 deg. 46 min., or in round numbers, 460 miles. It is 30 miles less than from Chicago to Omaha, by the lines of the Chicago, Milwaukee and St. Paul railway, over which the traveller rides in 24 hours. But this polar radius, though only 460 miles in extent, is covered by ice gorges and precipices of incredible difficulty; and frost is so severe that no instrument of human invention can measure its intensity, and it blisters the skin like extreme heat.

The greatest progress that has ever been made across these wildernesses of storm, of fury and desolation, was at the rate of five or six miles in a day, the explorers often necessarily resting as many days as they had before travelled miles in a single day, debarred by the obstacles that they had encountered.

The Coal Area of the World.

The coal area of the world is distributed as follows:

	Sq. Miles.		Sq. Miles.
United States	192,000	Germany	1,800
British America	18,000	Belgium	518
Great Britain	12,000	Rest of Europe	100,000
Spain	4,000	China	2,000
France	2,000	Japan	5,000

Railroad Facts.

The cost of railroads in the United States has been $9,000,000,000.

One million persons are employed by the railroads of the United States.

The cost of a high-class eight-wheel passenger locomotive is about $8500.

The cost of a palace sleeping-car is $15,000, or if "vestibuled," $17,000.

The average cost of constructing a mile of railroad in the United States at the present time is about $30,000.

The average daily earning of an American locomotive is about $100.

The "consolidation" locomotive weighs about 50 tons, and is able to draw on a level over 2400 tons.

The longest mileage operated by a single system is that of the Atchison, Topeka and Santa Fe—about 8000 miles.

The line of railroad which extends farthest east and west is the Canadian Pacific, running from Quebec to the Pacific Ocean.

There are 60 miles of snow-sheds on the Central Pacific Railroad.

The highest railroad in the United States is the Denver and Rio Grande at Marshall Pass—10,852 feet.

THE BARTHOLDI STATUE OF LIBERTY

The longest American railroad tunnel is the Hoosac Tunnel on the Fitchburg Railroad—4½ miles. (The St. Gothard Tunnel in Europe is over 9 miles in length.)

There are 208,749 railroad bridges in the United States, spanning 3213 miles.

The longest railroad span in the United States is the Cantilever span in the Poughkeepsie bridge over the Hudson River—548 feet.

The highest railroad bridge in the United States is the Kinzua Viaduct on the Erie road—305 feet high.

The Manhattan Elevated Railroad of New York carries the largest number of passengers of any American road, over 200,000,000.

A steel rail lasts, with average wear, about eighteen years.

The Fastest Locomotive Ever Built.

The largest and fastest passenger engine ever built, was by the Rhode Island Locomotive Works, for the New York, Providence and Boston Railroad Company. The main driving wheels are six feet in diameter, and set but seven feet six inches apart. This arrangement makes her run easily on curves. The cylinders are eighteen inches in diameter, with twenty-four-inch stroke. The boiler is fifty-four inches in diameter at the smoke-stack, with a wagon top. It extends to the very end of the cab, and necessitates the elevation of the engineer's seat to a height far above the fire door. The fire requires three tons of coal before the engine pulls out of the round-house to make her trips, and four tons will be carried on the tender. The tank of the latter will hold 4000 gallons of water, and the total weight of the engine proper is 93,000 to 95,000 pounds.

She looks to be enormously high as she sets up well in the air, and her short smoke-stack adds to her apparent height. Everything about her is steel. There is not a particle of brass or bright work about her. She makes the run from Providence to Groton, Conn., a distance of 62.5 miles, including a dead stop at Mystic drawbridge, as required by the statutes of Connecticut, in just 62.5 minutes, pulling at the same time eight cars, four of which are Pullman's.

One Railroad in Palestine.

There is but one railway within the province of the Jerusalem consulate. This connects Jerusalem with the seaport, Jaffa, and it is 53 miles long. Its simple Oriental name is Chemin de Fer Ottoman de Jaffa a Jerusalem. It is a French corporation, but is practically controlled by the Turkish government.

The line is in fair condition, but the accommodations for passengers are very bad, and would not be tolerated by the traveling public of Europe or the United States. It is difficult to keep the line in good condition, owing to the heavy grades and short curves among the mountains. In the distance of 53 miles the ascent is nearly 2500 feet, most of which is made during the last half of the distance. The road is single track and narrow gauge. The daily service consists of one passenger and one freight train each way. The first-class fare between the termini is $3, and a round-trip ticket is sold for $4.

There are numerous railway lines in South Africa, the railroad-building industry having in recent years assumed very extensive proportions. Owing to the soft nature of the soil and the frequency of the rains, most of the roadbeds are in a state of chronic instability. There is regular railway communication between Pretoria and Cape Town, a distance of 1040 miles. The first-class passenger fare is 6 cents a mile.

The Great Siberian Railway—a through line across Siberia 4715 miles long—is now under construction in three sections. This is one of the biggest railway engineering enterprises ever undertaken, involving, as it does, the tunneling of great mountains and the building of enormous viaducts and bridges. The Cheliabinsk-Omsk line is fast nearing completion. The Middle Siberian section, the construction of which was begun in 1893, is now well under way, and it is hoped that it will be finished very soon. The main trunk of the great line is under contract to be completed not later than 1900.

To Sweden is given the distinction of owning more railway mileage per capita than any other country in Europe, and a Swedish road enjoys the further distinction of being the only railway in the world that enters the polar circle.

The Seven Wonders of the World.

The "pyramids" first, which in Egypt were laid;
Next "Babylon's garden," for Amytis made;
Then "Mausolo's tomb" of affection and guilt;
Fourth, the "temple of Dian," in Ephesus built;
The "colossus of Rhodes," cast in brass, to the sun;
Sixth, "Jupiter's statue," by Phidias done;
The "pharos of Egypt" comes last, we are told,
Or the "palace of Cyrus," cemented with gold.

The Wonders of the New World.

The group of natural objects that have been classed as the seven wonders of the new world are, Niagara Falls, Yellowstone Park, the Mammoth Cave, the Canyons and Garden of Gods, Colorado; the Giant Trees, California; the Natural Bridge, Virginia, and the Yosemite Valley.

DATES OF FIRST OCCURRENCES

AFFIRMATION of the Quakers first accepted as an oath, 1702.

AIR-GUNS invented 1646; for throwing shells, 1886.

AMPHITHEATRE in Rome built A. D. 69.

AMPHYCTIONIC COUNCIL or General Assembly of Greece established B. C. 1497. This is the first instance on record of a free representation of independent states meeting to deliberate and settle their concerns by force of reason in place of arms.

ARITHMETIC by the Arabian figures introduced into Europe by the Saracens of Spain in the ninth century of the Christian era.

ASSASSINATION of Lincoln, April 14, 1865.

BAFFIN'S BAY, separating Greenland from North America, discovered by Captain Baffin in 1662.

BALLOONS said to have been invented by Gusmac, a Jesuit, 1729, but probably invented much earlier, and first used in France by Montgolfier in 1782.

BANKS in the United States commenced in the early part of the Revolutionary War. The first by a number of gentlemen in Philadelphia, June 17, 1780, with a capital of $839,160; instituted for the purpose of supplying the American army with provisions.

BAROMETERS invented by Forricelli, 1643.

BAYONETS invented at Bayonne, in France, 1670.

BLOOD, circulation of, through the lungs, first made public by Michael Servetus, a French physician, in 1553.

BOOKS in the present form were invented by Attalus, King of Bergumus, 887; the first supposed to be written in Job's time.

BREAD first made with yeast by the English, 1650.

BRICKS first used in England by the Romans—the size ordered by Charles I., 1625.

BURNING-GLASS and common mirrors date back to 1680.

CABLE, first Atlantic, operated 1858.

CANALS are of very ancient date, the first of which we have any record being that in Egypt between the Nile and Red Sea.

CARDS invented in France; first used for amusement by Charles VI., 1380.

CARRIAGES first introduced into Vienna 1515, into London 1580.

CHESS, the game of, invented B. C. 608.

CHINA, first voyage to, from the United States, 1784.

CHINA, PORCELAIN, first spoken of in history 1591.

CHLOROFORM was discovered in America and Germany, 1831. In 1847 it was brought into prominent notice as an anæsthetic by Sir James Simpson, of Edinburgh.

COLLEGE, Harvard is the oldest in the United States, established 1638.

COTTON first raised in Virginia 1621, first exported 1741.

CHRISTMAS day first observed as a festival, 98.

CIRCUMNAVIGATORS of the globe; the first was Magellan, or rather by his fleet, as he was himself slain on the voyage, 1522.

CLOCKS made to strike by Arabians, 800; by Italians, 1200.

CLOTH, coarse woolen, first made at Kendal, 1390.

COAL discovered near New Castle, England, 1234.

COIN, silver, coined in China, 1200 B. C.; in Rome, 576; in England, 1101.

COLLEGES as places of public instruction, in which academical degrees were granted, first established at Paris, 1215.

COMMERCE first mentioned in the book of Genesis, when Joseph's brethren sold him to a caravan of Ishmaelites.

COMPASS in use in Europe as early as 1180; variation first observed by Columbus and his companions 1492; used in China, 2634 B. C.

CONGRESS, Continental, first met in Philadelphia September 5, 1774.

COPPER MINES found in New York, 1722.

COUNCILS. The first Nicene, when 328 fathers attended against Arius, 325; at Nice, when Pope Adrian presided and 350 fathers attended, 787.

CHRISTIANITY was propagated in Spain in 36; in Britain, 60; or, as others say, in the 5th century; in Franconia and Flanders, in the 7th century; in Lombardy, Thuringia and Hesse, in the 8th century; in Sweden, Denmark, Poland and Russia, in the 9th century; in Hungary and Sclavonia, in the 10th century; in Vandalia and Prussia, in the 11th century; in Pomerania and Norway, in the 12th century; in Livonia, Lithuania and part of Tartary, in the 13th century; in Sclavonia, part of Turkey, and the Canary Isles, in the 14th century; in Africa, at Guinea, Angola, and Congo, in the 15th century; made great progress in Prussia, both the Indies and in China, by the Protestant faith, in the 16th century; reinstated in Greece, &c., &c., in the 17th century.

DELFT EARTHENWARE first made at Faenza, 1450.

DISTILLATION of spirituous liquors began in the 12th century; in Ireland, 1590.

ELECTRICITY, first idea of, given by two globes of brimstone, 1467; electric spark discovered at Leyden, 1746; first known it would fire spirits, 1756.

EMANCIPATION PROCLAMATION, by President Lincoln, January 1, 1863.

ENGRAVING on metal plates known in Europe, B. C. 504; on wood, invented in Flanders, 1423; on steel, became common about 1830; lithographic, invented by Senefelder, a German, about 1796.

ENVELOPES were first used in 1839.

ETCHING on copper, with aqua fortis, invented -512.

FIRE ENGINE, to force water, invented 1663.

FLAG, American, first used at Cambridge, Mass., by Washington, January 1, 1776. Legally established by Congress, June 14, 1777.

GAS, use of, introduced into London for lighting shops and streets, 1814; first into the United States, at Baltimore, 1821.

GILDING with leaf gold invented by Margaritone, 1273.

GYPSIES quitted Egypt, when attacked by the Turks, in 1515, and wandered over all Europe.

GLASS, the art of making it, known to the Romans before 79; Egypt, 1740 B. C.; the Chinese about 200; introduced into England by Benedict, a monk, 674; glass windows began to be used in private houses in England, 1180; glass first made in England into bottles and vessels, 1757; the first plate glass for looking glasses and coach windows, made at Lambeth, 1673; in Lancashire, 1773; window glass first made in England, 1557.

GOLD was first discovered in California, in 1848.

GRIST MILLS invented in Ireland, 214.

GUNPOWDER credited to Chinese; rediscovered, 1324.

HABEAS CORPUS ACT in England passed, 1641; attempt made in the Senate of the United States to suspend it, but rejected by the House of Representatives, 1806.

HACKNEY COACHES first used, 20 in number, in London, 1625.

HAIR POWDER in use in England, 1590; a guinea per year tax on those who wear it, 1795.

HANDKERCHIEFS first manufactured at Paisley in Scotland, 1748, when $80,000 worth were made.

HATS invented at Paris, 1404; first made in London, 1510.

HERALDRY had its rise about the year 1100.

HOUR GLASSES were invented in Alexandria, 240, and introduced at Rome 158 years B. C.

HUDSON'S BAY discovered by Captain Hudson, 1607.

INDIGO first produced in Carolina, 1747.

INFALLIBILITY. The dogma of Pagal Infallibility promulgated in 1870.

INOCULATION first tried on criminals, 1741; vacine discovered by Dr. Jenner, 1799.

INSURANCE on shipping began in England, 1560.

IRON discovered by the burning of Mt. Ida, 1406 B. C.; first cast in England, at Backstead, Sussex, 1544; first discovered in America in Virginia, 1715.

IRON STEAMSHIP, the first was built in 1830.

JUPITER'S SATELLITES discovered by Jansen, 1590.

JURIES first instituted by Ethelred II., King of England, 979; the plaintiff and defendant, in those times, used to feed them; whence the common law of denying sustenance to the jury after hearing evidence.

KEROSENE first used for illuminating in 1826.

KINGDOM, origin of, by Nimrod at Babylon, 2233 years B. C.

KING'S EVIL supposed to be cured by the touch of the Kings of England, the first king being Edward the Confessor, 1058. It was dropped by George I.

KISSING the Pope's foot first practiced, 709.

KNITTING STOCKINGS invented in Spain about 1550.

KNIVES first made in England, 1550.

LAMP for preventing explosion by fire-damp in coal mines, invented by Sir Humphrey Davy, 1815.

LANCASTRIAN SCHOOLS of education established in most of the principal towns of England, 1810.

LAWNS AND THREAD GAUZE were manufactured at Paisley in 1784.

LETTERS invented by Memnon, the Egyptian, 1822 B. C.

LIBERTY BELL, the most famous bell in America, relic most prized by the nation, hung in the tower of Independence Hall, Philadelphia, 1776, and was rung when the Declaration of Independence was adopted. It was cracked while tolling for the death of Chief Justice Marshall, 1835, and has never been put to public use since. It was exhibited at the World's Fair, Chicago, 1893, and at the Atlanta Exposition, 1895.

LINEN first made in England, 1253; the rich people wore linen, the poorer woolen shirts.

LOCOMOTIVE, the first use of one in this country was in 1820.

LOCUSTS, the country of Palestine infected with such swarms of, that they darkened the air, and after devouring the fruits of the earth, they died, and their intolerable stench caused a pestilential fever, 406. A similiar circumstance occurred in France, 873; a large swarm of, flew over the city of Warsaw, June 17, 1816; swarms of, made their appearance near Aschersleben, June 24, 1816.

LOOKING-GLASSES made only at Venice, 1300.

LOOMS, the power loom invented by the Rev. Mr. Cartright, a clergyman of Kent, England, 1787.

LOTTERIES, the first mentioned by historians for sums of money, 1630.

MAGNIFYING-GLASSES first made in England by Roger Bacon, 1260.

MAMMOTH, first fairly complete one discovered near the mouth of the Lena, in Siberia, 1806.

MAPS AND GLOBES invented by Anaximander, 600 B. C.

MARBLE PAPER, a German invention belonging to the 17th century.

MATCHES, friction, first used in 1829.

MECKLENBURG Declaration of Independence issued May 31, 1776.

MICROSCOPES first used in Germany, 1621; the double ones, 1624; solar microscopes invented, 1740.

MILITARY ACADEMY, West Point, founded by Congress, March 16, 1802.

MISSOURI COMPROMISE passed March 3, 1820, and appealed May 24, 1854. It restricted slavery to south of 36° 30′.

MONASTERY, the first founded where the sister of St. Anthony retired, 270; the first founded in France, near Poictiers, by St. Martin, 360; Constantine IV. sends for a great number of friars and nuns to Ephesus, orders them to change their black habits for white and to destroy their images; on their refusal he orders their eyes to be put out, banishes them, and sells several monasteries, appropriating the produce, 770; they were totally suppressed by Act of Parliament in 1539.

MONEY, first mentioned as a medium of commerce in the twenty-third chapter of Genesis, when Abraham purchased a field as a sepulchre for Sarah, in the year of the world 2139; first made at Argos, 894 B. C.; has increased eighteen times its value from 1290 to 1640; and twelve times its value from 1530 to 1800.

MONROE DOCTRINE declared in the message of President Monroe, December 2, 1823. Re-asserted by President Cleveland in a message to Congress concerning the boundary line dispute between Venezuela and Great Britain, December, 1895.

MORMONS, sect of, founded by Joseph Smith, 1830; removed from Nauvoo to Salt Lake Valley, Utah, July 24, 1847.

MUSICAL NOTES invented in 1070; improved, 1330; printed, 1502.

NANTES, Edict of, tolerating Protestants, 1598; revocation, 1685.

NEEDLES first made in England by a native of India in 1545.

NEW ORLEANS, battle of, January 8, 1815, Jackson defeating the British. Captured by Farragut, April 26, 1862.

NEWSPAPER, the first authentic copy was printed in 1494; first daily, *Frankfort Gazette*, 1615. The first English was the *Weekly Newes*, 1622; the first in France, *Gazette de France*, 1631. The first advertisement appeared in 1648. The first American newspaper was printed in Boston, September 25, 1690, and was called *Publick Occurrences, Foreign and Domestic*. The first continuously printed in America was the *Boston News Letter*, 1702; first daily, *The Pennsylvania Packet*, 1784.

NULLIFICATION ORDINANCE passed by South Carolina, November 19, 1832. The proclamation of President Jackson denouncing the same was issued December 10, 1832.

ORGANS were invented in 755.

OXFORD UNIVERSITY, England, founded by Alfred, 886.

PAINTING, earliest account of, in the reign of Ninus, about 2000 B. C.

PAPER CURRENCY established in America May 15, 1775. Paper money first used in America, 1740.

PAPER made from silk, China, 120 B. C.; from rags, Egypt, 1085.

PARCHMENT invented by King Attalus of Pergamus, 887 B. C.

PATENT RIGHT LAW first enacted in United States, April 15, 1790.

PAVING with stones first introduced, in Paris, 1186.

PEARLS, artificial, were invented 1686.

PENS for writing were first made from quills in 635. The substitution of steel for quill pens took place early in the present century, yet strange to say, nothing is known with certainty of the person who first invented the metallic pen. Fountain pens and glass pens are of recent date.

PENNYPOST set up in London and suburbs, by one Murray, an upholsterer, 1681, who afterwards assigned the same to one Dockwra; afterwards claimed by the government, who allowed the latter a pension of £200 a year, in 1711; first set up in Dublin, 1774; it was improved considerably in and round London, July, 1794; made a two-penny post in 1801.

PHILADELPHIA was founded by William Penn in 1682. Riots, native American and Irish, May 6 to 8, 1844. First National Convention of the Republican Party, 1856.

PHONOGRAPH invented in 1877 by Thomas A. Edison.

PHOSPHOROUS first made in 1677.

PHOTOGRAPHS were first produced in England in 1802; perfected in 1841.

PIANOFORTE invented about 1710 in Italy.

PINS were brought from France, and first used in England by Catherine Howard, Queen of Henry VIII. Before that time both sexes used ribbons, loop-holes, laces with points and tags, hooks and eyes, and small skewers made of gold, silver and brass. Pins were first made by machinery in America in 1832.

PIPES OF LEAD, for water, first cast in 1539.

PISTOLS first used by the cavalry in 1544.

PITCH and tar first made from pit coal at Bristol, in 1779.

PLASTER OF PARIS. Casting with it from the face invented in 1470.

PORCELAIN of Saxony greatly improved in 1767.

PORT-HOLES introduced for ships of war in 1545.

POST-OFFICE first established between Vienna and Brussels in 1516. Posts established regularly between London and all the principal towns throughout England in 1635. Postage stamps were introduced in England in 1840; in the United States in 1847.

POTTERY improved greatly by Wedgwood in 1763.

PRINCE OF WALES, the title of, first given to the king's eldest son, 1286.

PRINTING. The Assyrians and Babylonians used clay tablets, and wooden blocks were used by the Chinese as early as 952. Printing from movable types was invented by Faust in 1441, and made public by Gutenberg in 1454, although the invention is also claimed for L. Koster, of Haarlem, as early as 1423. The first Bible was printed by Faust and Schoffer, in 1456, and they also printed the first book with date, a Latin Psalter, 1457. Wooden type first introduced into England, by William Caxton, a London merchant, in 1477. The first English press was set up in Westminister Abbey, where it remained until 1494. The first American book, "Escala Espiritual," was printed by Juan Hablas, Mexico, about 1535. The first press in the United States was that of Stephen Daye, at Cambridge, Mass., 1639. Printing in colors was first introduced in 1626.

PYRAMIDS first erected about 2170 B. C.

QUICKSILVER first used for refining silver ore, in 1540.

RAILROAD. The first passenger railroad was opened in England, September 27, 1825; the first in America, Baltimore and Ohio, 1828, although freight was moved by rail at the granite quarries, of Quincy, Mass., as early as 1826. The first steam railroad was operated in the United States in 1830, from Albany to Schenectady—16 miles.

REFORMATION in Germany, 1517; in England, 1532.

REPUBLICAN PARTY. The first convention was held at Pittsburgh, February 22, 1856.

RESUMPTION of Specie Payments in the United States—Act approved 1875; took effect January 1, 1879.

RIBBON LOOMS. It has been asserted that these looms were first known to the Swiss, but others claim their invention for a German in the town of Dantzic in the 16th century.

RULING-MACHINES invented by a Dutchman in London in 1792.

SADDLES. Pliny informs us that one, Pelethronius, was the first to introduce a piece of leather fastened to the back of a horse for the accommodation of its rider. For a long time these cloths and pieces of leather were regarded as unmanly, and were, therefore, regarded by soldiers with great scorn. The old German races despised the Roman cavalry for riding on such effeminate contrivances. Saddles of the kind now used appear to have been in use in 385. Side-saddles first used in 1380. Previous to their introduction women always rode astride.

SAILCLOTH first made in England in 1590.

SALTING HERRINGS after the Dutch method first used in 1416.

SALTPETER first manufactured in England, in 1625.

SAWS. The inventor of the saw is said, by the old Greek writers, to be Talus or Perdox. Pliny ascribes the invention to Dœdalus, but Hardouin affirms that the passage in which he does so refers to Talus, and not to Dœdalus. Talus was the son of a sister of Dœdalus, and the invention is said to be due to his using the jawbone of a snake to cut through a piece of wood. His master grew jealous of the honor Talus won by this invention, and caused him to be privately put to death.

SCHOOLS, public or common, first known in America, were established in the New England States about 1642.

SEDAN CHAIRS introduced into England in 1734.

SEWING-MACHINE first patented in England, in 1755 The first complete machine was constructed by an American, Elias Howe, in 1846.

SEXTANT invented by Tycho Brahe, at Augsburg, in 1550.

SHAY'S REBELLION, in Massachusetts, 1786–87.

SLEEPING-CARS were first used in 1858. Pullman's patent dates from 1864.

SOAP first made in London and Bristol in 1524. The first express mention of soap appears in Pliny and Galen. The former speaks of it as an invention of the Gauls.

SPEAKING-TRUMPETS invented by Kircher, a Jesuit, in 1652.

SPINNING-WHEEL invented at Brunswick, 1530.

SPECTACLES invented by Spina, a monk, of Pisa, in 1299.

STAMP ACT enacted March 22, 1765; repealed March 19, 1766.

STATUTES of the United States first revised and codified in 1873.

STEAM. The steam engine boiler was discovered by the Marquis of Worcester in 1663. Newcommen's engine was patented in 1705, and the invention was perfected by James Watt in 1773. The high pressure engine was invented by an American, Oliver Evans in 1779. The first steam vessel of which there is any record was that of Papin (France), in 1707. Then follow those of Jonathan Hulls (England), 1736; William Henry (Conestoga River, Pa.), 1763; James Rumsey (Md.), 1786; John Fitch (Delaware River), same year. In 1806 Robert Fulton constructed the Clermont, which plied regularly between New York and Albany, at a speed of five miles per hour. The first steamer crossing the Atlantic made the voyage from Savannah to Liverpool in twenty-five days, A. D. 1819.

STEEL. The invention of steel is of very great antiquity and the process of hardening iron is described in the Old Testament (Isaiah xliv, 12). The helmet of Hercules, described in Hesiod, appears to have been of steel. Homer refers to the process of hardening steel by immersing it, while red hot, in cold water.

STEREOTYPE PRINTING invented by William Gid, a goldsmith, of Edinburgh, in 1735.

STIRRUPS, according to a statement made by the Emperor Mauritius, were first used in the 6th century. Hippocrates and Galen speak of a disease which, in their time, was occasioned by long and frequent riding, because the legs hung down without any support.

SUGAR is first mentioned in 625 by Paul Egineta, a physician. It came originally from China and the East; was produced in Sicily in 1148, in Maderia in 1419, in the Canary Islands in 1503, and in the West Indies by the Portuguese and Spaniards in 1510. In 1641 it was cultivated at Barbadoes. Sugar-refining was first carried out by a Venetian in 1503, and this process was adopted in England in 1569. Sugar cane was first cultivated in the United States in 1751, near New Orleans, the first sugar mill being constructed in 1858.

SUNDAY-SCHOOLS were first established by Robert Raikes, Gloucester, England in 1781.

SUN-DIALS invented 558 B. C. The first in Rome, 308 B. C., was that erected by Papirius Cursor, when time was divided into hours.

TANNING LEATHER. A new and more expeditious method than that previously in use was invented in 1795.

TAX. The first tax levied on the people was by Solon, 540 B. C.

TEA first known in Europe in 1610, being brought from India by the Dutch.

TELEGRAPHS (mechanical) invented in 1687. First used by the French in 1794, and by the English in 1796. The first electric telegraph was operated from Paddington to Drayton, England, in 1835, the same year in which Morse's telegraph was invented. The first telegraph line in operation in America was between Baltimore and Washington in 1844. The first submarine cable was laid in 1851, between Dover and Calais, and the first Atlantic cable was operated in 1858.

TELEPHONE. A. Graham Bell first presented a speaking telephone at the Centennial Exposition, Philadelphia, in 1876.

TELESCOPES. The first reflecting telescope made on the principle discovered by Sir Isaac Newton in 1692.

TEMPERANCE SOCIETY, the first in this country was organized in Saratoga County, N. Y., in March, 1808.

THREAD first made at Paisley, Scotland, in 1722.

THERMOMETERS first invented by Drebel, a Dutchman, in 1620; improved by Reaumur in 1730, and by Fahrenheit in 1749.

TOBACCO was first introduced into England, from Virginia, in 1583.

UNION of England and Scotland, 1707; Great Britain and Ireland, 1801.

VACCINATION. See *Inoculation*.

VENTILATORS first introduced by the Rev. Dr. Hales in 1740.

VIOLINS of the modern kind invented about 1477. Introduced into England by Charles II.

WALL-PAPERS first used in Spain and Holland in 1555. Flock or velvet wall-papers were first used in 1620.

WAR SHIPS. In 1814 Sir Robert Seppings introduced various most important improvements for the construction of war ships. The lower parts of the frames of ships of war were then, for the first time, filled in, a system of diagonal trussing was introduced, the stern was altered in form, so that it no longer remained open to the fire of an enemy, and the upper decks were enlarged. Sir W. Symonds altered them so as to decrease the quantity of ballast required in 1832. In the International Exhibition of 1851 various improvements in this direction were shown, but great iron-cased ships were not then thought of. In July, 1854, the first of a new class of screw, gun vessels was launched for use during the Russian war. To operate with these, vessels of iron were constructed to bombard the fortresses in the Baltic. The first French iron-cased ship was a frigate called the "Cloire," and this was quickly followed by the first English ship of that kind, the "Warrior." Since then vessels of this kind have been subject to a variety of alterations and experiments tending to improve both their strength and their sailing qualities. The first battle between iron ships of war occurred in the war for the Union, the Merrimac and Monitor being the contestants.

WATCHES were invented at Nuremberg in 1477, and were first introduced into England from Germany in 1577.

WATER MILLS for grinding corn are said to have been invented by Belisarius when Rome was besieged by the Goths in 555. Pliny, however, mentions wheels turned by water.

WEATHER-COCKS. The earliest mention of a weather-cock is that made by Vitruvius, concerning that on the tower built at Athens by Andronicus Cyrrhestes.

WILD-FIRE invented by a Greek in 663.

WILMOT PROVISO, to restrict slavery, offered in the House of Representatives, August 8, 1846, by David Wilmot, of Pennsylvania.

WIRE invented at Nuremberg in 1351.

WIRE-DRAWING. The first record we have of this art is probably that contained in Holy Writ, where we are told that gold was beaten and cut to threads, so that it could be interwoven in cloth. The present mode of forming metallic threads, that known as wire-drawing, was first known in the 14th century.

WOOLEN CLOTH. Although the making of woolen cloth is one of the most ancient arts, its manufacture was not known in France until 1646, when it was made at Sedan. It was first made in England in 1331, but was not dyed or dressed until 1667.

YELLOWSTONE NATIONAL PARK established by Act of Congress, February 28, 1871.

THE COUNTRIES

OF THE

WORLD

Historical and Statistical Information.

A CONDENSED history of the nations of the globe, containing information relating to the forms of government and present condition of the people, is not only of interest to the general reader, but also furnishes information of great value. In this way the ends of the earth are brought near. A panorama of past events, including those of most recent date, passes before the eye. Here, also, means are afforded for obtaining that culture which cannot be complete without a knowledge of the world at large.

It must have occurred to every student of history that there are great masses of rubbish of no account, which are, in fact, a hindrance and vexation. Only by condensing the voluminous records of the past, and bringing them within a narrow compass, are we able to trace the golden chain of events.

The following pages present the essential facts of history, enabling the reader to obtain a clear and intelligent idea of those annals which preserve the life and deeds of nations The aim has been to depict great historic features, furnishing a record of the most important transactions, and otherwise gathering into this treasury of knowledge such information as will be of the greatest practical value. This comprehensive survey of the countries of the world forms a ready hand-book for everyday use.

A Fountain of Knowledge.

That a knowledge of history, ancient and modern, forms an important part of education, is conceded by every thoughtful person. For this reason the study of this subject is required in all our schools and academies, and it is admitted that a finished education demands a thorough acquaintance with history, no less than with the common branches universally taught, or with the sciences and ancient languages. This subject is one of the great sources of the world's knowledge and wisdom, and while it has its dry details and facts, it is also invested with romance, the charm of which never dies.

The comprehensive history of nations includes their origin and certain great features which have resulted from political changes. We behold revolutions, sanguinary battles, struggles for better forms of government, the peaceful achievements of diplomacy, and mark the great convulsions, victories and enterprises, which have changed the pages that record the annals of the past, and, as it were, have formed the world anew.

THE UNITED STATES

AMERICA, including a vast extent of territory, embracing every variety of climate, and bearing within it, besides its precious ore and gems, the germs of immense wealth, remained undiscovered until the 11th of October, 1492, when Christopher Columbus, a native of Genoa, who had sailed from Spain with three small vessels under the patronage of Ferdinand and Isabella, the Castilian monarch, first beheld a light on the shore of the new continent, two hours before midnight. On the next day he set foot in the New World.

The Christian adventurers did not fail to kneel upon the sand and offer up their thanks for having been preserved through the perils of a long voyage. This island was called Guanahani, by the natives, a name which Columbus altered to St. Salvador, and was one of the Bahama Islands.

It is worthy of remark that the vast continent which Columbus discovered was not called by his name, but derived its appellation from Amerigo Vespucci, a Florentine navigator, who made some subsequent discoveries, in company with Alonzo de Ojeda, in 1499. Columbus did not rest satisfied with his first successful voyage or the fame which he acquired by it, but he undertook others. He was, however, in the end, the victim of jealousy and ingratitude. The Spanish colonists at Hispaniola became discontented and preferred complaints against him, sending home accusations and remonstrances by every ship that sailed to Spain.

The Discoverer in Irons.

In consequence of this, Don Francisco de Bobadilla was sent out by the court, and invested temporarily with the chief power, being permitted to use his own judgment in quelling the disturbances of the colonies. This person scrupled not to arrest Columbus and put him in irons, from which he would not suffer himself to be freed, when he was sent to Spain.

"No," said he, when the attendants offered to remove them; "the truth must be apparent, and my patrons are too noble, too generous to overlook me. Then, if fortune again smiles upon me, these will serve as affecting memorials of sorrow past; I will not part with them, and I even wish that, when I am no more, they may be suspended over my sepulchre." When he again set foot in Spain, he might have exclaimed, in the language of the poet:

"Are these the wreaths of triumph you bestow
On those who bring you conquest home and honor?"

Columbus was liberated immediately by royal order, and received at court with great respect. But though Bobadilla was recalled, Columbus in vain supplicated to be restored to his government; he was put off by vague promises, and the post finally given to Don Nicholas Ovando, a practical as well as accomplished man. Thus after three momentous voyages, and the acquisition of much fame, he found himself displaced and thwarted in a point in which he conceived his honor concerned, and his hard-earned authority torn from his possession.

But it was not the nature of Columbus to sink under his misfortunes; on the contrary with four small caravels, the largest being but of seventy tons burthen, he set out on his fourth voyage of discovery with the intention of completing the circumnavigation of the globe, visiting the Indies, of which Vasco da Gama had given so inspiriting an account.

A Singular Occurrence.

Leaving Cadiz on May 9, 1502, he reached Martinique, one of the Windward Islands, June 15. Having touched at Cuba, he pursued a southwesterly course, until he reached Guanaja, an island on the coast of Honduras, whose inhabitants had attained a pretty high degree of civilization. Their persons were covered with cotton garments dyed with a variety of bright and pleasing colors.

He mentions a curious occurrence as taking place here. He had been presented, among other animals, with a peccary, or American pig, and one of those monkeys with prehensile tails, indigenous to America. The peccary being thrown in the way of the monkey, the latter, by a dexterous use of its tail, confined the jaws of the pig in such a manner as to expose it helplessly to the action of the monkey's claws. "This appeared to me so strange," Columbus writes to his patrons, "that I thought fit to write it down for the information of your majesties."

The Spaniards entertained the most exaggerated ideas of the wonders of the New World. To most of them, it appeared a realm of magic, a fairyland, in which supernatural occurrences were by no means infrequent. Thus Juan Ponce de Leon, in 1512 fitted out three ships from Porto Rico, of which he was governor and set forth in search of an Indian fountain which was fabled to restore all who bathed in it, even if they were tormented by the infirmities of extreme old age, to the freshness, vigor and beauty of youth. Although he failed to find the fountain, he made the discovery of Florida.

Extinction of the Red Men.

From the time of the first European settlements in this part of America, the number of the Indians has diminished rapidly, and they are now reduced to a mere handful, whom the wave of emigration is fast rolling to the shores of the Western Ocean. They have seen their hunting grounds diminished, their forests swept away by their white foes, and the smoke of the Christian village rising where once their council-fires blazed.

The discovery of America awakened the enterprise of various nations of the Old World, and they fitted out numerous expeditions to conquer and colonize. North America, which is of vast extent, its surface containing about eight millions of square miles, fell into the hands of the English, French and Spanish. Mexico, so valuable for its mines of gold and silver, inhabited at the period of its discovery by intelligent and peaceable nations, was conquered by Fernando Cortez, a Spanish general, who scrupled not to make use of the basest treachery, and to shed the blood of the natives like water,

to accomplish his purposes. Mexico was for a long time attached to Spain, to which it furnished immense wealth, but at present has a republican government which it can hardly be said to enjoy, the country is in such an unsettled state.

The eastern shores of North America, were settled principally by the English. In spite of the hostility of the Indians, the ravages of disease and hardship, the colonies increased rapidly. The population of the middle portion of North America, now called the United States, was estimated, in 1775 at about 3,000,000. The number of the colonies was thirteen. Poverty and oppression had first driven them from their native land.

Settlement of the Colonies.

The following dates of the settlement of the colonies, are given for reference:

Virginia, 1607.

New York, by the Dutch, 1614; occupied by the English, 1664.

Plymouth, 1620; incorporated with Massachusetts in 1692.

Massachusetts, 1628.

New Hampshire, 1623.

New Jersey, by the Dutch, 1624; occupied by the English in 1664.

Delaware, by the Dutch, 1627; occupied by the English in 1664.

Maine, 1630; united with Massachusetts in 1677.

Maryland, 1633.

Connecticut, 1635.

New Haven, 1637; united with Connecticut in 1662.

Providence, 1635; Rhode Island, 1638; } united 1644.

North Carolina, 1650.

South Carolina, 1670.

Pennsylvania, 1682.

Georgia, 1733.

The English settlers in the northern parts of America, were influenced by different motives from those which actuated the Spaniards who quitted their native country for the shores of the New World. The latter were urged onward by a reckless spirit of adventure, by the promptings of heated imaginations, and by the most insatiable cupidity. The former were impelled by far worthier motives. Many causes operated together in the mother country, to favor emigration among the resolute and hardy.

The people of England had been led to examine the nature of the power to which they were subjected, and the monstrous doctrines of prerogative and religious intolerance, were denounced by many who had courage to think and speak for themselves upon the subjects. The friends of republican institutions multiplied with great rapidity, the natural result of the progress of literature, and the increase of wealth with the commons. In 1628 the wealth of the House of Commons far exceeded that of the House of Lords.

The English Puritans.

At the same time, the reformation which had been carried into effect by Henry VIII, while it had purged the country of many abuses long complained of, had established a form of worship which was regarded by many as little better than that which had given way before it. Those who refused to conform to the established form, contemptuously termed *Puritans* by their opponents, and anxiously sought scope for the exercise of religious rights, and, since the immunities they demanded were not granted them at home, determined to seek refuge from persecution in a remote quarter of the globe.

King James granted, in 1606, letters patent to two companies, called the London and Plymouth Companies, by which possession

1620

was given them of the territories lying between the 34th and 45th degrees of north latitude; the southern part to the London, and the northern part to the Plymouth Company: the king himself having undertaken to frame for them a code of laws.

Three ships were provided by the London Company, on board of which were 105 persons, who were expected to remain at Roanoke, which was the place of their destination. They made a settlement on a peninsula and called it Jamestown. This was the first permanent settlement made by the English in Virginia.

Story of Captain Smith.

Shortly after, the company received supplies from England, and an accession to their numbers, swelling the number to 200. Two vessels were freighted for England; one loaded with a yellow and brilliant sand, common in many places in the vicinity, but supposed by the colonists to contain a large proportion of gold; the other vessel was loaded with tobacco. The most efficient member of the council was Captain Smith, who was taken by the Indians while on an exploring expedition.

He was led to the place of execution, and his head placed upon a stone, while Powhatan, the Indian chieftain, stood over him with uplifted club, regardless of the earnest solicitations of his daughter Pocahontas, then about 13 years of age. The princess, finding her entreaties unavailing, fell upon Smith, folded him in her arms, and laid her face upon his, determined to meet death with him she could not save. Moved by this touching devotion, Powhatan relented, and, two days afterwards, sent Smith to Jamestown.

In 1609, the destruction of the whole colony was planned by the Indians, but their plans were defeated by the exertions of the princess Pocahontas, who, in a dark night, went to Jamestown, and put the president upon his guard. Pocahontas married an English gentleman by the name of Rolfe, embraced the Christian religion, and was baptized by the name of Rebecca. She died four years after at Gravesend, on her return with her husband from England. In 1619, twenty negroes were brought to Virginia in a Dutch vessel, and sold to the colonists, whence one may date the commencement of the slaveholding system.

In 1614 Captain Smith was sent from England to explore North Virginia. He ranged the coast from Penobscot to Cape Cod, making observations on the shores, harbors, islands and headlands; and made a map of the country, which on his return to England, he showed to Prince Charles (afterwards Charles I), who gave it the name of New England.

Arrival of the Pilgrims.

The Rev. Mr. Robinson with his flock, of the Reformed Church of the North of England, removed to Amsterdam in 1606, and soon after to Leyden. A variety of motives led his congregation to turn their attention to the New World; the principal were, the enjoyment of perfect liberty of conscience; "the preservation of ecclesiastical affairs distinct from those of the State;" and a hope of laying the foundation of an extensive empire, that should be purged from all religious impurities.

Having made an arrangement with the Virginia Company, they sailed from Plymouth, Eng., on September 6, 1620, and on November 10th anchored in Cape Cod harbor. Perceiving that they were so far north as to be without the territory of the South Virginia Company, some hesitation arose;

but the winter was at hand, and it was now too late to go in search of a settlement within the jurisdiction of that company.

Previous to their landing, after prayer and thanksgiving, they formed themselves into a body politic, binding themselves by a written covenant to be governed by the decisions of a majority. This instrument was subscribed by 41 persons, who, with their children and domestics, composed a company of 101 persons. Mr. John Carver was chosen, without one dissentient voice, governor for one year.

Saved from Famine.

Parties were sent on shore to make discoveries. Some Indians were seen but could not be overtaken. A considerable quantity of corn was found in heaps of sand, secured in baskets, which served for seed the ensuing spring, and tended to save the adventurers from famine. On December 6th, Carver, Standish, Winslow, Bradford and others, sailed to various places, to discover a suitable situation for a settlement. Monday, December 11, O. S., they landed at what was afterwards called Plymouth, and from the excellence of the harbor, and the favorable appearance of the land, resolved to commence a settlement here.

In 1637 the troops of Massachusetts and Connecticut had several engagements with the Pequot Indians, and finally subdued them. This year was made famous by a great theological disturbance caused by Ann Hutchinson, a woman of considerable talents, who was accused of maintaining heresies, and supporting them by lectures frequently given to large audiences. The result was a synod of the ministers, elders and messengers of the churches, who, after three week's deliberation, condemned as heretical eighty-two opinions which had been disseminated in New England, and some banishments took place, among them that of Mrs. Hutchinson, her husband and children.

In 1750 a number of noblemen, merchants and others, of London, together with some influential Virginia planters, formed a society under the name of the Ohio Company, for the purpose of commerce with the Indians and the settlement of parts of the country. The French Governor in Canada fearing the valuable fur trade of the French would be destroyed, infringed upon the possessions of the Ohio Company, who laid their grievances before Dinwiddie, Lieutenant-Governor of Virginia.

The Assembly of Virginia determined to demand, in the name of the King, that the French should desist. George Washington, then in his 22d year, was despatched to the French Commandant to convey the demand. As this was not complied with, the British determined to attack Fort du Quesne (now Pittsburg), and Washington commanded the expedition, which, although unsuccessful, reflected upon him great credit.

Brave to the Last.

On the arrival of Braddock, in the spring of 1775, various military operations were planned. An expedition against Canada was successful, but the conquered territory was speedily relinquished by the victors. General Braddock's expedition against Fort du Quesne was disastrous in the extreme. Heedless of the advice of Washington, who cautioned him against an ambush, he pressed forward, and was surprised by the Indians.

Instead of retreating or scouring the woods, Braddock vainly endeavored to form his men; and continued with wanton bravery on the spot where he was first attacked, till three horses were shot under him; when he received a shot through the lungs and fell.

The remains of the army immediately fled, bearing away the body of their rash and unfortunate commander. Every mounted officer except Washington, was either killed or wounded, and he was providentially preserved, for an Indian had marked him as a victim, and fired at him several times with a rifle that had never before deceived him; 64 out 85 officers, and half the privates were killed. But Washington bore off the wreck of the forces with consummate skill and undaunted courage. The war was continued until 1763, and, although the military operations were occasionally unsuccessful, the bravery of the British and provincial troops prevailed, and the fall of Quebec gave a death blow to the hopes of the French.

Events Preceding the Revolution.

We now come to the commencement of those acts which created that patrotic feeling in the colonies, which resulted in the Declaration of their INDEPENDENCE.

In 1674 the Parliament of Great Britain passed an act, the preamble to which ran thus: "Whereas it is *just and necessary* that a *revenue* be raised in America, for defraying the expenses of defending, protecting and securing the same, etc." The act then proceeds to lay a duty on clayed sugar, indigo, coffee, silk, molasses, calicoes, etc., being the produce of a colony not under the dominion of his majesty. To this the colonists submitted; though not without complaint and remonstrance.

Massachusetts recommended a colonial congress, to consult for the general welfare. A congress from most of the colonies, consisting of twenty-eight members, met at New York; remonstrated against the Act of Parliament; petitioned for its repeal; and made a declaration of the rights of the colonies; declaring that taxation and representation were inseparable; and that Parliament had no right to take their money without their consent.

In 1767, the Chancellor of the Exchequer brought into Parliament a bill for imposing a duty to be collected in the colonies on glass, paper, painter's colors and tea.

The Tea Thrown Overboard.

The colonists were again violently excited The corresponding committees, which had been forming throughout the colonies for the last two years, excited resistance, declaring such as aided directly or indirectly in these violations of liberty, enemies to their country The consequence was that the cargoes of tea, sent to New York and Philadelphia, were sent back: and those sent to Charleston, stored, but not offered for sale. The tea ships, intended for the supply of Boston, after the inhabitants had tried in vain to have them returned, they being consigned to the relations of Governor Hutchinson, were entered by about seventeen persons in the disguise of Indians, and three hundred and forty-two chests of tea were thrown into the dock, no other damage being done.

In January, 1775, the Earl of Chatham brought forward a conciliatory bill in the House of Peers, which was rejected two to one. Lord North, the Prime Minister, introduced a bill for restraining the trade of the New England colonies. Receiving information of the general opposition in the southern colonies, he introduced another bill, equally restraining their trade, but excepting North Carolina, Delaware and New York.

The time had now come for testing the nerve of the colonists. An attempt was made by the British troops to seize the military stores at Concord, April 19, but they had to encounter the armed opposition of the militia at Concord and Lexington. Boston

was now blockaded. Ticonderoga and Crown Point were taken. The battle of Bunker's Hill followed, and an unsuccessful expedition against Canada preceded the Declaration of Independence.

On May 10, 1775, the Continental Congress met at Philadelphia, and on June 15, unanimously elected George Washington, then a member from Virginia, Commander-in-Chief of the forces raised, and to be raised, for the defence of the colonies. June 7, 1776, Richard Henry Lee, of Virginia, made a motion in Congress, for declaring the colonies free and independent. After much debate, on the Fourth of July, the thirteen colonies were declared free and independent, under the title of The United States of America.

Gallant Defence of the Fort.

An attempt was made in June and July, with 3000 British troops, under the command of General Clinton and Sir Peter Parker, to destroy the fort on Sullivan's Island, near Charleston (S. C.). The fort was defended by Colonel Moultrie with about 400 men. After an action of ten hours, the British were forced to retire with a loss of about 200 men. Ten Americans were killed and 20 wounded.

Soon after the evacuation of Boston by the British troops, March 17, Washington made his headquarters at the city of New York, with the principal part of the army. British troops to the number of 24,000 men under Lord Howe, and his brother, Sir William Howe, landed, August 22, on Long Island near the Narrows, about nine miles from the city. The American forces, at this time, amounted to upwards of 17,000 men, and those principally raw recruits.

A battle was fought on Long Island, August 27, in which the Americans were defeated. The battle of White Plains took place on October 28. The retreat of the American forces through the Jerseys and across the Delaware followed; the battles of Trenton, December 26, and Princeton, January 3, 1777, were also among the events of this period.

The campaign of 1777 closed under better circumstances. General Burgoyne surrendered at Saratoga, October 17. In 1778 a treaty of commerce and alliance was made between Louis XVI and the Commissioners of the United States, on February 6th. French troops soon after arrived. Various military operations ensued. In the Southern States, where there was no regular American army, the partisan warfare kept up by Marion, Sumter, Morgan, and Green, thinned the ranks of their enemies. On October 19, 1781, Cornwallis surrendered at Yorktown. The fall of this large British army may be considered as the closing of the war.

Public Thanksgiving.

General Washington ordered divine service in the different divisions and brigades. Congress went in solemn procession to the Dutch Lutheran Church in Philadelphia, returned thanks to Almighty God for the success of the combined armies, and recommended a day of general thanksgiving and prayer throughout the United States.

Savannah was evacuated in July, 1782, and Charleston in December. Great Britain acknowledged our independence November 30, 1782. Holland acknowledged the independence of the United States in April; Sweden in February, 1783; Denmark in the same month; Spain in March; Russia in July.

The debt of the United States, at the close of the war, was $40,000,000. Congress had power to make war, and to create debts, but no power to carry on the war, nor ability to pay debts, but by appeals or recommendations to thirteen independent sovereignties,

whose unanimity alone, seldom to be expected could support public credit, or give efficacy to the proceedings of Congress.

The new Federal Government was established in 1789. Washington was unanimously chosen first President, and John Adams Vice-President. Mr. Jefferson was selected for the Department of State.

Depredations by France.

The Indian War and an insurrection in the western part of Pennsylvania, on account of the tax on domestic spirits were favorably terminated. The insults and maritime depredations committed by the French, induced America to take up arms in defence of her rights, but a change of rulers in France prevented the effusion of blood. On the retirement of Washington, John Adams was elected to succeed him, and in 1801, Thomas Jefferson was chosen the third President of the United States.

The claim of searching American vessels, and impressing from them British seamen, and the British orders in council prohibiting the exportations of the United States, together with other outrages committed by the British, produced a declaration of war against Great Britain in June, 1812. The successes of the British were but few and trifling, while the American navy triumphed in a series of brilliant exploits, and the gallant defence of New Orleans by Gen. Andrew Jackson, crowned the American arms with laurels. Peace was concluded at Ghent, December 24, 1814.

The next great event of national importance was the war with Mexico. What is now known as Texas was claimed by that country. The territory was sparsely settled, mainly by adventurers from the Southern States. In 1836 Texas revolted from Mexico and established a Republic. In 1845 Texas was annexed or re-annexed to the United States and admitted as a State. A dispute with Mexico at once arose as to its Western boundary and war followed, the Union forces being commanded by Gen. Zachary Taylor and Gen. Winfield Scott. The war resulted disastrously to the Mexicans under Gen. Santa Anna, and a treaty of peace was concluded in 1848.

The Irrepressible Conflict.

The subject of slavery created a growing agitation throughout the country, which resulted in the formation of the Republican party in 1856, with Col. John C. Fremont as its candidate for the Presidency. It sprang rapidly into power, but failed to obtain a majority of the votes of the Electoral College. The agitation of the subject of slavery continued with great vigor and bitterness. Upon the election of Abraham Lincoln as President in 1860, eleven of the Southern States seceded and formed an independent government.

The people of the North resisted the dismemberment of the Union and the great Civil War followed. In January, 1863, President Lincoln, by proclamation declared the slaves in the part of the South then in rebellion, free. The character of the struggle was at once changed in the eyes of foreigners, and the sympathy of the outside world turned gradually to the North. The struggle between the North and the South was one of vast magnitude. Sanguinary battles were fought on land and water. At length the Federal forces, under Gen. Ulysses S. Grant, were victorious, and on April 9 1865, the Confederate army, under Gen. Robert E. Lee, surrendered at Appomattox Court House, Va.

On April 15, 1865, President Lincoln was assassinated at Washington, and an attempt

was made upon the life of Mr. Seward, Secretary of State. The war had cost the nation some $10,000,000,000.

The seceded States were again taken into the Union on conditions contained in the 13th, 14th and 15th amendments to the Constitution, abolishing slavery, and giving the negro the right to vote. In 1867 the United States purchased Alaska from Russia. In 1884 the Democratic party reorganized and elected its candidate, Mr. Cleveland, over Mr. Blaine. In 1888 the Democrats made the campaign on the basis of a reformed tariff. The Republicans won, Mr. Harrison becoming President, and by passing what are known as the McKinley Bill and the Administrative Bill reformed the tariff in the directive of protection to American industries.

Result of Election.

In 1890 a House of Representatives overwhelmingly Democratic was elected.

In 1892 the election resulted in the return of the Democratic candidate, Mr. Cleveland, by a large majority over Mr. Harrison. Mr. Cleveland was inaugurated on March 4, 1893.

On the first of May following, the World's Fair was opened at Chicago, the object of which was to commemorate the discovery of America by Columbus.

The elections of November, 1894, resulted in Republican victories all over the Union.

The Presidential campaign of 1896, which was one of unusual excitement on account of the monetary questions involved, resulted in the election of Hon. William McKinley as President and Hon. Garret A. Hobart as Vice-President, the former of Ohio and the latter of New Jersey. Mr. McKinley was inaugurated March 4, 1897.

The insurrection which broke out in Cuba in 1895 continued, and was a subject of grave consideration by our Government. On the 15th of February, 1898, the United States battleship Maine was destroyed in the harbor of Havana, resulting in the death of 266 officers and men. This unfortunate incident had much to do in precipitating the war with Spain, which was declared by the United States, April 21, 1898.

The coast of Cuba was at once blockaded by the North Atlantic squadron. On May 1st, the United States Asiatic fleet, under Admiral Dewey, destroyed the Spanish squadron in the harbor of Manila, gaining thereby a great naval victory.

Thrilling Events.

An attack on Santiago de Cuba by United States troops under command of General Shafter resulted in the capture of that city in the early part of July. On the 3rd of the same month the Spanish squadron, under Admiral Cervera, attempted to escape from the harbor of Santiago and was totally destroyed by the United States fleet. A treaty of peace between Spain and the United States followed.

Prince Henry, brother of Emperor William of Germany, visited the United States in Feb. 1902; he was cordially received.

On September 8, 1900, Galveston, Texas, was visited by a storm which swept the sea over the city and resulted in the loss of nearly 5000 lives.

President McKinley was assassinated at the Pan-American Exposition at Buffalo, on September 6, 1901, by Leon Czolgosz, an Anarchist. He died September 14, and was buried on the 19th at Canton, Ohio, amidst an unparalleled demonstration of public sorrow. Vice-President Roosevelt became President.

The Star-Spangled Banner

O! say, can ye see by the dawn's early light
What so proudly we hail'd by the twilight! last gleaming?
Whose bright stars & broad stripes, through the clouds of the fight
O'er the ramparts we watch'd were so gallantly streaming
And the rockets red glare, the bomb bursting in air
Gave proof through the night that our flag was still there
O! say does that Star-Spangled Banner yet wave
O'er the land of the free & the home of the brave?

On that shore, dimly seen through the mists of the deep
Where the foe's haughty host in dread silence reposes.
What is that which the breeze, o'er the towering steep
As it fitfully blows, half-conceals, half-discloses?
Now it catches the gleam of the morning's first beam,
In full glory reflected now shines on the stream.
'Tis the Star-Spangled Banner - O! long may it wave
O'er the land of the free & the home of the brave

And where is that band that so vauntingly swore.
That the havoc of war & the battle's confusion
A home & a country should leave us no more?
Their blood has wash'd out their foul footstep's pollution.
No refuge could save the hireling & slave
From the terror of flight or the gloom of the grave
And the Star-Spangled Banner in triumph doth wave
O'er the land of the free & the home of the brave.

O! thus be it ever when freemen shall stand
Between their loved homes & the war's desolation.
Blest with victory & peace may the heav'n rescued land
Praise the power that hath made & preserved us a nation
Then conquer we must - when our cause it is just,
And this be our motto - In God is our trust -
And the Star-Spangled Banner in triumph shall wave
O'er the land of the free and the home of the brave.

Washington,
Oct 21 — 40

FAC-SIMILE OF THE ORIGINAL COPY OF THF STAR-SPANGLED BANNER.

America.

My country, 'tis of thee, Sweet land of liberty.
Of thee I sing:
Land where my fathers died, Land of the pilgrims' pride,
From every mountain side
Let freedom ring.

Thy native country, - thee, Land of the noble, free, -
Thy name I love;
I love thy rocks and rills, Thy woods and templed hills,
My heart with rapture thrills
Like that above.

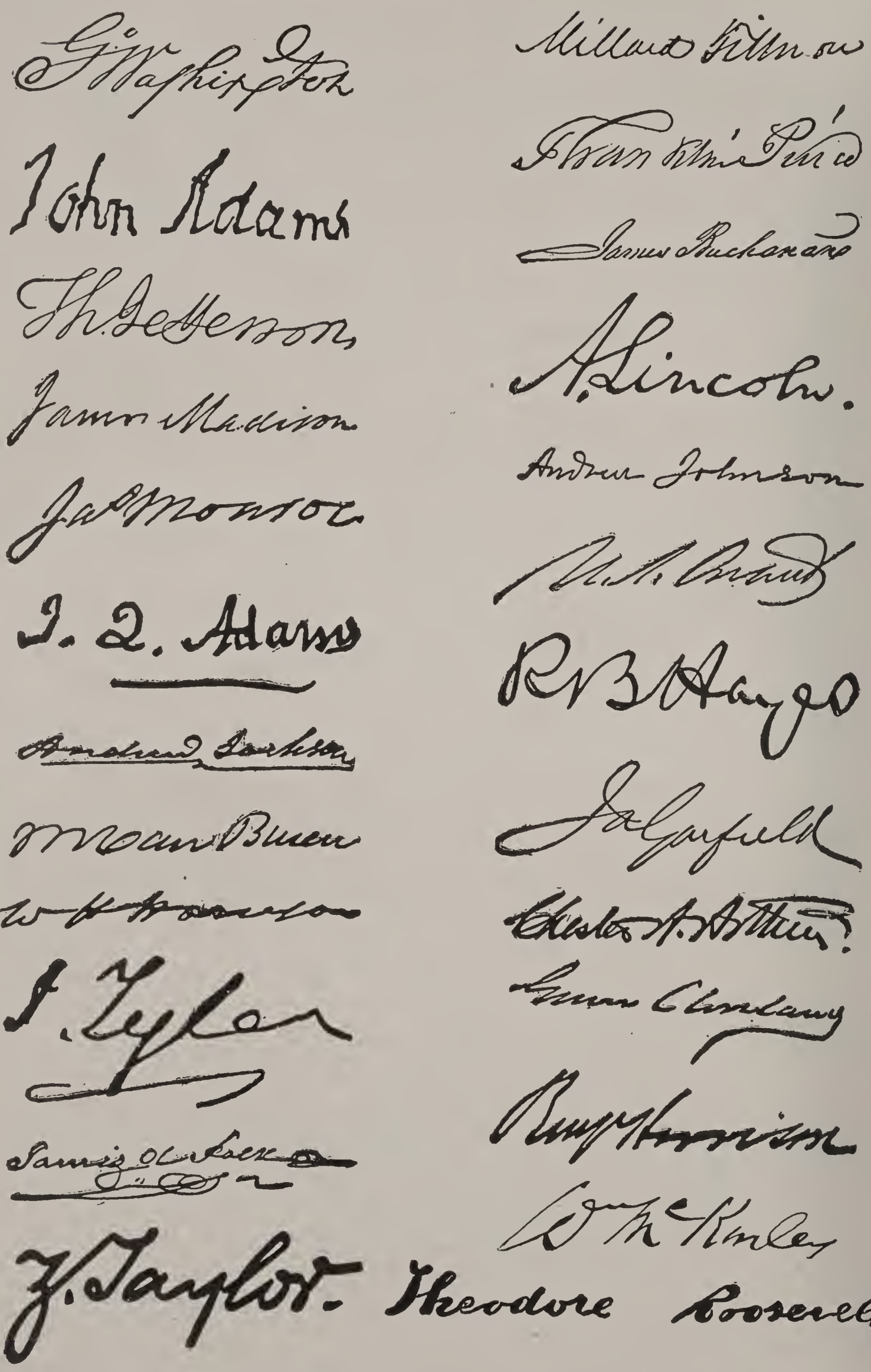
Let music swell the breeze, And ring from all the trees
Sweet freedom's song;
Let mortal tongues awake, Let all that breathe partake.
Let rocks their silence break, -
The sound prolong.

Our fathers' God, - to Thee, Author of liberty,
To Thee we sing;
Long may our land be bright With freedom's holy light;
Protect us by thy might,
Great God, our King.

1832 — 1892.

S. F. Smith

FAC-SIMILE OF THE ORIGINAL COPY OF OUR NATIONAL HYMN.



AUTOGRAPHS OF THE PRESIDENTS

GREAT SEAL OF THE UNITED STATES.

COAT-OF-ARMS OF VIRGINIA.

COAT-OF-ARMS OF NEW YORK.

COAT-OF-ARMS OF MASSACHUSETTS.

COAT-OF-ARMS OF MARYLAND.

COAT-OF-ARMS OF NEW JERSEY.

COAT-OF-ARMS OF NEW HAMPSHIRE.

COAT-OF-ARMS OF DELAWARE.

COAT-OF-ARMS OF CONNECTICUT.

COAT-OF-ARMS OF RHODE ISLAND.

COAT-OF-ARMS OF PENNSYLVANIA.

COAT-OF-ARMS OF NORTH CAROLINA.

COAT-OF-ARMS OF SOUTH CAROLINA.

COAT-OF-ARMS OF GEORGIA.

COAT-OF-ARMS OF VERMONT.

COAT-OF-ARMS OF KENTUCKY.

COAT-OF-ARMS OF TENNESSEE.

COAT-OF-ARMS OF OHIO.

COAT-OF-ARMS OF LOUISANA.

COAT-OF-ARMS OF INDIANA.

COAT-OF-ARMS OF MISSISSIPPI.

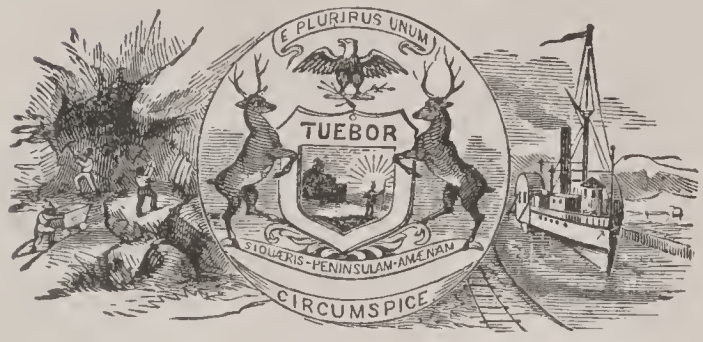
COAT-OF-ARMS OF ILLINOIS.

COAT-OF-ARMS OF ALABAMA.

COAT-OF-ARMS OF MAINE.

COAT-OF-ARMS OF MISSOURI.

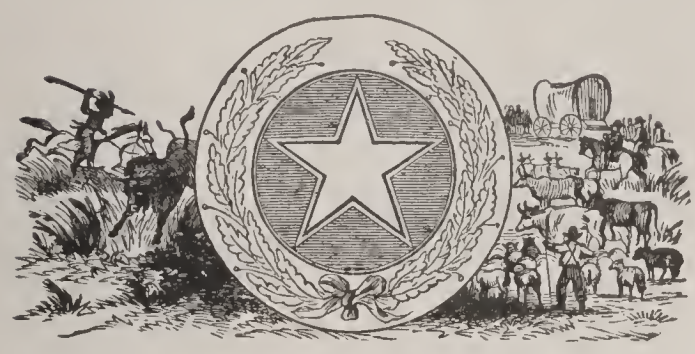
COAT-OF-ARMS OF ARKANSAS.



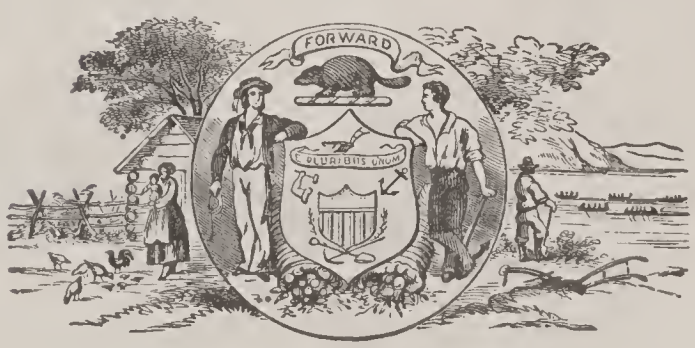
COAT-OF-ARMS OF MICHIGAN.

COAT-OF-ARMS OF IOWA.

COAT-OF-ARMS OF FLORIDA.



COAT-OF-ARMS OF TEXAS.



COAT-OF-ARMS OF WISCONSIN.

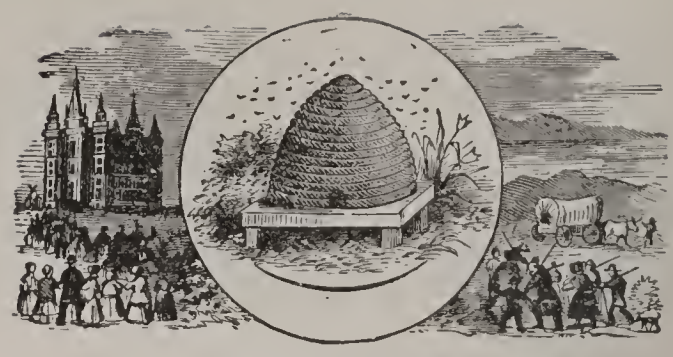
COAT-OF-ARMS OF CALIFORNIA.

COAT-OF-ARMS OF MINNESOTA.

COAT-OF-ARMS OF OREGON.

COAT-OF-ARMS OF KANSAS.

COAT-OF-ARMS OF WEST VIRGINIA.



COAT-OF-ARMS OF UTAH.

COAT-OF-ARMS OF NEBRASKA.

COAT-OF-ARMS OF NEVADA.

COAT-OF-ARMS OF MONTANA.

COAT-OF-ARMS OF COLORADO.

COAT-OF-ARMS OF SOUTH DAKOTA.

COAT-OF-ARMS OF NORTH DAKOTA.

COAT-OF-ARMS OF IDAHO.

COAT-OF-ARMS OF WASHINGTON.

COAT-OF-ARMS OF WYOMING.

THE DOMINION OF CANADA

IN 1534 Jacques Cartier, a French navigator, a native of St. Malo, set out from that port with two small vessels of twenty tons each, landed on the shores of Gaspe (now part of the province of Quebec), and took possession of the country in the name of his sovereign, Francis I. He went again in the following year (1535), passed up the gulf and river, which he named the St. Lawrence, and reached Stadacone, the site of the present city of Quebec. Continuing his voyage, he arrived at Hochelago, another Indian town, and gave it the name of Mont Royal, since corrupted into Montreal.

After passing the winter at Stadacone, he returned to France. But little or nothing was done to promote the colonization of the country until 1608, when Samuel de Champlain, a Frenchman of gentle birth, maritime and military experience, and much religious enthusiasm, visited Canada for the third time, with the object of extending Christianity and developing trade and commerce, and founded the city of Quebec, the name of which is said to be derived from an Indian word kebec, "the rock."

The control of the immense region, extending eastward to Acadia (Nova Scotia), westward to Lake Superior, and down the Mississippi as far as the Gulf of Mexico, was from this time until 1763 claimed by France. Recollet and Jesuit missionaries traversed it in all directions, suffering great hardships in their endeavors to convert the Indians. Their work was watched with much enthusiasm in France, and it is admitted that they were the first explorers of the country and the pioneers of civilization in the Far West.

The claims of France were not, however, undisputed, as is shown by the grant of a charter in 1670 by Charles II to Prince Rupert and his company, known ever since as the Hudson Bay Company of the exclusive right of trading in the territory watered by streams flowing into Hudson Bay. As already mentioned, they gave up their exclusive rights in 1869 on certain conditions, among others, a money payment of £300,000 and a large grant of land.

Long and Bitter Struggle.

The struggle between Great Britain and France for supremacy in North America was long and bitter, but it terminated finally in 1763 by the cession to the former under the Treaty of Paris of Canada with all its dependencies, except the Islands of St. Pierre and Miquelon, which were retained as fishing stations, not to be fortified or garrisoned. Hudson Bay with the adjacent territory, Nova Scotia and Newfoundland had been previously transferred to England by the Treaty of Utrecht in 1713. The population of Canada in 1763 was about 70,000, of Nova Scotia, 8000.

No time was lost in attempting to adapt British institutions to the new possession; but considerable friction occurred for some years, and it was not altogether allayed by the passing in 1774 of what is known as the Quebec Act. This gave the French-Cana-

dians the free exercise of their religion, and secured their civil rights, laws and customs. It annexed large territories to Quebec, including that part of the United States now forming Minnesota, Wisconsin, Michigan, Ohio, Indiana and Illinois, which passed from Great Britain in 1783.

Quebec was eventually in 1791 divided into Upper and Lower Canada; but this did not prove satisfactory in either province, leading to conflicts between the popular and elected assemblies and the nominated or official councils, and ultimately to the unsuccessful rebellion in 1837-38.

The representatives from each province in the united parliament were equal in number. Upper Canada, however, made greater progress than Lower Canada (the population in 1851 was 952,004 and 890,261 respectively, and in 1861, 1,396,061 and 1,111,566), and agitated for an additional number of members and claimed other concessions, but the demands were always opposed by the latter. The consequence was frequent legislative deadlocks and continual difficulties. Such was the state of things in 1864.

It is now necessary to refer to the other colonies on the Atlantic and Pacific coasts.

UNIVERSITY OF TORONTO.

In accordance with Lord Durham's recommendations, the two provinces were reunited in 1840 (population of Upper Canada, 450,000; of Lower Canada, 650,000), but the union was not a success politically, although it indirectly led to the great confederation in 1867. It should be mentioned that the inhabitants of Upper Canada consisted largely of United Empire loyalists, who remained loyal to British institutions, and who left the United States at the close of the War of Independence, while those of Lower Canada were almost exclusively French-Canadians.

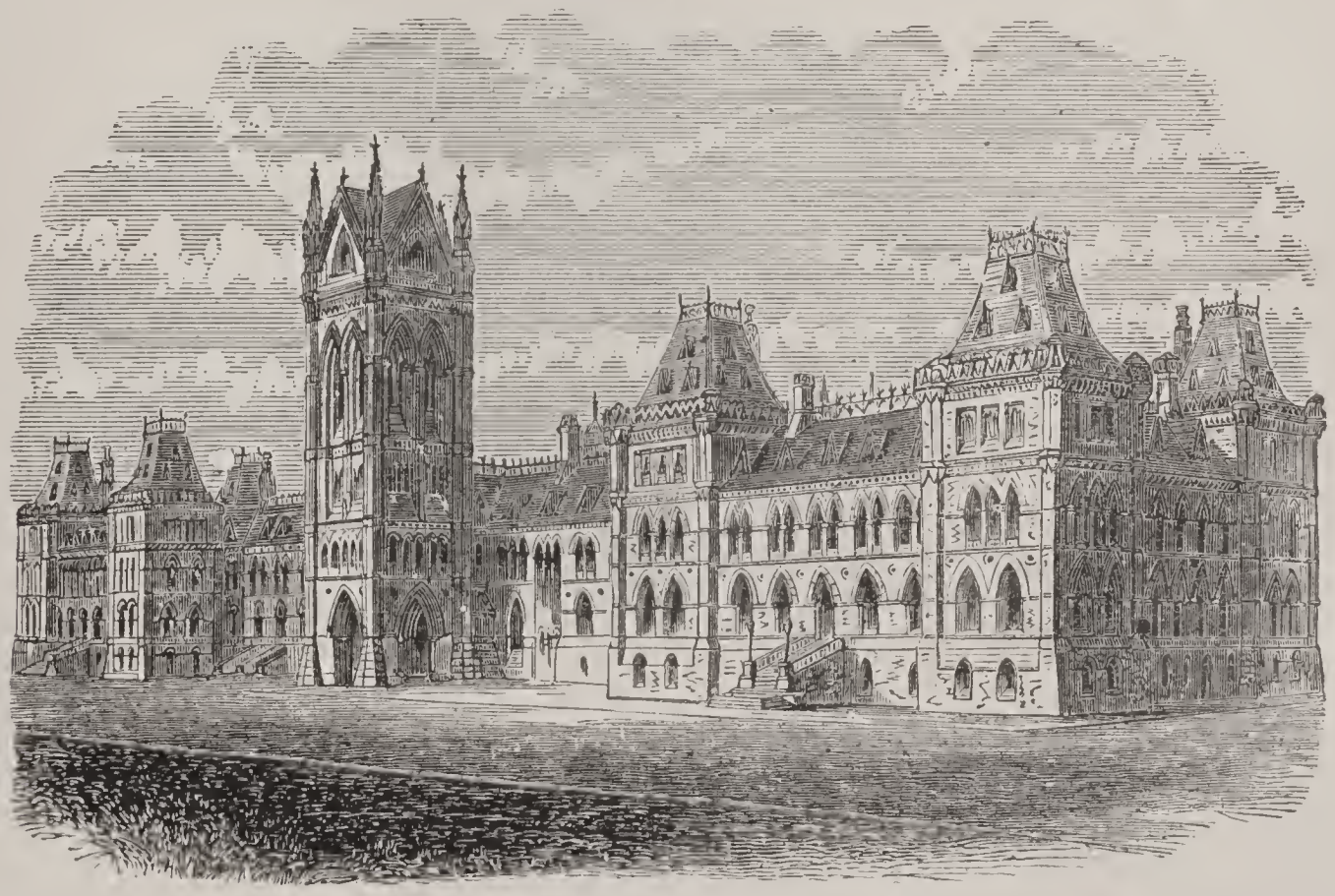
In 1770 St. John Island (renamed Prince Edward Island in 1780), and in 1784 New Brunswick, were formed out of Nova Scotia into separate colonies. In 1858, owing to the rush for gold and the influx of population, British Columbia was make a crown colony, and in 1866 Vancouver Island was joined to it. In 1864 the maritime provinces were discussing the desirability of local confederation, and advantage of the opportunity was taken by Canada to propose a broader scheme to cover all British North America, and after several confer-

ences a basis of union was agreed upon which resulted in the formation of the Dominion.

Since the confederation of the provinces, the chief events have been as follows: The Red River Rebellion, which collapsed in August, 1870; treaty of Washington, 1871, dealing with fisheries and the mutual use of certain canals; outbreak of half-breeds under Louis Riel in March, 1885, resulting in the speedy suppression of the rebellion and Riel's execution; and the treaty for the settlement of the fisheries dispute, signed by the British and United States representatives February 15, 1888. Sir John MacDonald died June 7, 1891, his funeral being attended by a vast concourse of people In October the Dominion Government refused to acquiesce in the copyright treaty between England and the United States, claiming that the treaty was not international.

The voting in Ontario on the Prohibition Plebiscite resulted in a prohibition majority of 81,769. This was in 1894 and shows the widespread agitation at this time upon the question of temperance. Charges of bribery and corruption were made in Newfoundland during the same year and the ministry was compelled to resign, April 11. Much excitement was caused throughout the country on account of the Manitoba school question involving the sectarian issue; judgment was pronounced in favor of the minority, February 6, 1895. This was followed by a remedial order which was adopted by the Cabinet Council, March 19.

After a heated campaign the New Brunswick elections resulted in a complete victory for the government, by a vote of 35 to 8,



PARLIAMENT HOUSE, OTTAWA.

October 17, 1895. Canada exports chiefly coal, gold, copper, iron, phosphates, salt, mineral oils and gypsum. Gold mines are worked in Nova Scotia and other parts of the country. The fisheries, as regards the area of water available, are the largest in the world. A bounty is offered by the government for the vessels making the largest catch. The canal and river improvements have cost large sums of money and are works of great utility and importance. English is generally spoken in the Dominion, but in some parts of the province of Quebec

French is the only language understood. In the Dominion, Quebec and Manitoba Parliaments, members may address the House in either language. In Quebec province the speeches are usually in French, which seems to retain a strong hold upon the people.

MEXICO

WHEN the Spaniards, under Cortez, commenced the conquest of Mexico in 1519, they found the native Indians far advanced in civilization, wealthy and hospitable. They had some knowledge of art and architecture, and some ideas of civilized life. They had an instinctive dread of the foreigners, and yet treated them with kindness. The country continued under the jurisdiction of a Spanish viceroy, until it declared itself independent in 1820, and has so continued to the present time.

In 1825 a treaty of commerce was formed with Great Britain. The expulsion of the Spaniards was decreed in 1829, and a Spanish expedition against Mexico was unsuccessful. On the 11th of May, 1833, after a revolution such as have been common in Mexico, Santa Ann was made President. This resulted in the independence of Mexico.

ENTRY OF THE FRENCH INTO THE CITY OF MEXICO.

which was recognized by Brazil in 1830 and by Spain in 1836.

In 1845 occurred the war between Mexico and the United States respecting the possession of Texas, and the Americans having been victorious, a treaty of peace was ratified May 19, 1848. Since this time there has been no rupture of peaceful relations between the two countries.

In 1863 an assembly of notables at the city of Mexico decided on the establishment of a limited hereditary monarchy, with a Roman Catholic Prince as Emperor, and offered the crown to the Achduke Maximilian of Austria. The attempt, aided by the French, proved unsuccessful, and after a condition amounting to civil war, the Republican element of Mexico was successful, and Maximilian was seized and shot, June 19, 1867. The city of Mexico which was held by the monarchial party was taken by the opposing forces after a siege of sixty-seven days, and the Republic was re-established.

During the same year the Mexican Congress assembled, Jaurez acting as provisional president; he was re-elected in December of the same year. A series of insurrections followed through the efforts of different parties to obtain control of the government. The insurgent Diaz defeated the government troops, entered the city of Mexico and assumed power as provisional president in November, 1876. Diaz retained the presidency of the Republic, and continued his administration.

Mexico is rich in mines and is a large exporter of coffee and tobacco. In addition to these, the chief agricultural products are maize, barley, wheat, beans, cotton, sugar cane, rice, cocoa and vanilla. Large numbers of cattle are reared in Mexico for the United States and other countries.

ENGLAND

IT is a well-known fact of history that the western part of England was known to the Phœnicians, and was resorted to by them for its tin, about four centuries B. C.; hence the whole country received the name of the *Cassiterrides* ("Tin Islands"). When invaded by Cæsar, B. C. 55, it was called *Britain*, or sometimes *Albion*. The Romans subdued all England, and some parts of Scotland and Wales, but did not reach Ireland. though its existence was known to them.

In the third century of the Christian era, adventurers from the opposite coasts of Germany settled in various parts, and joined with the Britons in forcing the Romans to abandon the Island, A. D. 410, after a rule of about 400 years, traces of which still remain in every quarter. The Britons, being divided into as many hostile states as they had cities, were unable to resist the fresh hordes (now called *Saxons* and *Angles*) that poured into the island, and about 459 the kingdom of Kent was founded.

The Britons still fought stubbornly, but

were gradually driven westward, and by the year 584 the kingdom of Mercia was established, being the last of the seven kingdoms founded by the invaders, whence the name of the *Heptarchy*. In 827, Egbert, king of Wessex, obtained the supremacy over his rivals, and declared himself King of England.

BATTLE OF HASTINGS—DEATH OF HAROLD.

His descendants, of whom Alfred the Great was the most illustrious, held the throne for more than 200 years, but the country suffered greatly during the time from the ravages of the Danes, who, under Canute and his sons, became its ruler for 25 years (1017–1042). The Saxon line was restored in the person of Edward the Confessor, to whom Harold succeeded; but his death in the battle of Hastings, 1066, gave England into the hands of the Norman kings, who reigned from 1066 to 1154.

Then came the Plantagenets (1154–1485); the Tudors (1485–1603); and the Stuarts (1603–1714), to whom the House of Brunswick succeeded on the death of Queen Anne. The conquest of Ireland was begun in the year 1170, but can hardly be regarded as completed till the surrender of Limerick in 1691. Wales was conquered by Edward I. in 1282, and formally annexed to England by Henry VIII. in 1536.

Alliance with France.

Scotland successfully resisted the efforts of Edward I. to subjugate it, maintained for ages a close alliance with France, and in 1603 gave a ruler to England in the person of James VI., who became James I. of Great Britain, a title then first assumed. This was but a personal union, but the political union of the two kingdoms was effected under Queen Anne in 1707. Ireland which had been hitherto only styled a lordship, was declared a kingdom in 1542, and this kingdom declared a member of the triple monarchy of Great Britain and Ireland by the Act of Union, 1801.

Early in the present century there was a determined and successful effort by the Irish Catholics to obtain religious emancipation. At length the leaders of the Whig party made common cause with the classes hitherto excluded from government, and backed at once by the traders and artisans, forced upon an unwilling Parliament the Great Reform Bill of 1832, which marked an important epoch in English history.

From this time there has been a marked change both in the position of England and in the character of the questions which have excited public interest. Still mistress of the sea, and possessed through its colonies of an empire distributed in every corner of the globe, England has found enough to do in the preservation and improvement of this gigantic dominion, and has as far as possible abstained from interference in continental quarrels.

Vast Power and Influence.

Once and again it has shown its influence. In 1848, the year of revolutions, and in the subsequent consolidation of Italy, its sympathies were not hidden, but there was no thought of active interference. It allowed the great American Republic to settle its disputes uninterrupted, save by sympathy at first shown to the South. It adopted the same attitude of non-intervention in the Prussian wars against Denmark, against Austria and against France. It has only been in questions which seemed to touch the safety of its eastern empire that it has drawn the sword.

The Crimean War was avowedly for the maintenance of Turkey as a check upon Russia, which was threatening the road to India. Of the same class have been the wars in Egypt and Afghanistan. Still more directly when India itself burst into insurrection was England called upon to interfere and engage in the victorious but terrible campaigns which marked the suppression of the mutiny. The other wars, and they are not few, have all been connected with mercantile and colonial interests. The questions which have chiefly moved men's minds have been of a social or mercantile character.

The extension of the electoral franchise, the reform of municipalities, the repeal of the corn laws, the establishment of free trade, the improvement of the condition of the working classes, the regulation of strikes and trades-unions, a national system of education, and of late years the question of the management of Ireland, have been the points round which political interest has centred. They are the fitting questions to occupy a democracy. To that phase of political life in one way or other England is fast hastening.

It has still to be seen whether under such conditions means will be found to keep together those colonies which are already to all intents and purposes independent, and to preserve to the empire the magnificent position which the gradual development of physical and political forces has secured.

Table of Kings and Queens of England.

	Began to Reign.
NORMAN LINE.	
William I.	October 14, 1066
William II.	September 9, 1087
Henry I.	August 2, 1100
Stephen	December 2, 1135
FAMILY OF PLANTAGENET.	
Henry II.	October 25, 1154
Richard I.	July 6, 1189
John	April 6, 1199
Henry III.	October 19, 1216
Edward I.	November 16, 1272
Edward II.	July 7, 1307
Edward III.	January 24, 1326
Richard II.	June 21, 1377
HOUSE OF LANCASTER.	
Henry IV	September 29, 1399
Henry V.	March 23, 1413
Henry VI.	August 31, 1422
HOUSE OF YORK.	
Edward IV.	March 1, 1461
Edward V.	April 9, 1483
Richard III.	June 22, 1483
YORK AND LANCASTER UNITED IN THE HOUSE OF TUDOR.	
Henry VII. of Lan.	August 22, 1485
Henry VIII.	April 22, 1509

Edward VI	January 28, 1547
Mary I	July 6, 1553
Elizabeth	November 17, 1558

HOUSE OF STUART.

James I	March 24, 1603
Charles I	March 27, 1625
Cromwell, Protector	From 1649 to 1660
Charles II	January 30, 1660
James II	February 6, 1685
William and Mary	February 13, 1689
William alone	from December 28, 1694
Anne	March 8, 1702

BRUNSWICK FAMILY.

George I	August 1, 1714
George II	June 11, 1727
George III	October 25, 1760
George IV	January 29, 1820
William IV	June 26, 1830
Victoria	June 20, 1837
Edward VII	January 22, 1901

SCOTLAND

FROM historic records it appears that the first inhabitants of Scotland were Celts, and probably were the same as the early Britons, Welsh and Irish. They defended themselves against the Romans, who could never subdue the people of the Highlands. They were so troublesome that the Roman generals caused a wall to be built from the Solway Firth to the river Tyne.

Thus the Scots were shut up in their own country, like a herd of unruly cattle; but they contrived to get over the wall pretty often. In three or four hundred years after Christ a tribe of Goths, called Picts, came over from the continent and settled in the country. These inhabited the Lowlands, and lived by agriculture. The Scots dwelt in the mountains, carrying on war, and subsisting by the chase.

Thus the nation become divided into Highlanders and Lowlanders, and thus, to some extent, the people remain to this day. They live peaceably now, but in early days they quarreled fiercely. In 839, it is said that Kenneth II., who was a Highland leader, subdued the Picts, and became first king of all Scotland. From this time to Edward I. of England, there was a constant change of sovereigns. Edward Longshanks, the same that subdued Wales, made war upon the Scotch, imprisoned Wallace, and had prepared a great army for the final subjugation of Scotland, when he died. Edward II., was beaten by Robert Bruce at the glorious battle of Bannockburn. This event occurred in 1313, and secured the freedom of Scotland, which had been threatened by the English kings.

Incessant Warfare.

From this time the history of Scotland tells of little but civil wars and bloody battles with England, till the time of James V. He assumed the reins of government in 1513, at the age of eighteen months. He afterwards lost the confidence of his army, and they deserted him in the hour of need. This broke his heart, and he starved himself to death in 1542 at the age of thirty-one.

His daughter was the beautiful and un-

fortunate Mary Queen of Scots, as she is called, and who was educated in France, and was not only very handsome, but very accomplished. While she was yet a young lady she was taken to Scotland and became queen. But beauty, accomplishments and power, cannot insure happiness. Mary's kingdom was in a state of great trouble; the people were divided among themselves, and Mary found it impossible to govern them. At length she became afraid that they would kill her, and, to save her life, she went to England and placed herself under the protection of Elizabeth, who caused her to be put in prison, and finally took her life, thus ending her many misfortunes.

The son of Mary, James VI. of Scotland, succeeded his mother, and after the death of Elizabeth he became King of England also, under the title of James I. Though he lived in England he did not forget Scotland. He loved learning and caused schools to be established in his native country. These schools are continued to this day, and therefore it is very uncommon to meet with a Scotchman who is wholly uneducated.

From the time of King James, in 1603, Scotland has been attached to the British crown. She has sometimes rebelled, and in the cause of the Stuarts she fought a good many battles. But Scotland has long been a peaceful portion of the British kingdom.

IRELAND

THE origin of the ancient Irish race is involved in much obscurity; ethnologists, however, generally agree in describing it as belonging to the old Brito-Celtic stock. Under the name of *Scoti*, they became known to the Romans by their incursions upon Britain. In the third century A. D., through the supposed influence of St. Patrick, the natives of the island became Christianized, and by the sixth, learning and civilization had become largely diffused throughout its limits.

In 1014 A. D., the Danish invaders were overthrown by King Brian Boru in the battle of Clontarf. In 1155, Pope Adrian IV. granted Ireland, by special bull, to Henry II. of England, and the island received shortly afterward a permanent English colonization. In 1210 King John granted a Charter to the Irish, which received confirmation at the hands of his son, Henry III.

In the sixteenth century, Henry VIII. introduced the Reformed Faith, and assumed the title of *King of Ireland*. Under James I. the province of Ulster received a large immigration of Scottish and English settlers, who introduced Presbyterianism. In 1641 the Catholic population raised a formidable revolt against the English Protestants, 40,000 of whom were killed in Ulster alone.

Anarchy continued to prevail till 1649, when the English republican, Cromwell, crushed it out with a hand of iron. In 1688, the Irish people—except the Ulster Protest-

ants—espoused the cause of James II.—a cause extinguished by the defeats of Boyne and Aughrim.

In 1798, the Irish Catholics again rose in revolt, and received some trifling aid from France; this insurrection ended in their being more firmly riveted to England than before. In 1800, the Irish Parliament voted the legislative union of Ireland with England; in 1829, the Catholic Emancipation Bill passed the Imperial Parliament; in 1848, a so-called "manifesto" of the "Young Ireland party" provoked an unsuccessful attempt at insurrection under William Smith O'Brien and others; and since then the *Fenians, Home Rulers, Land Leaguers* and other modern partisans of Irish Independence have been a cause of anxiety and trouble to the British Government.

The government is semi-independent, an English viceroy, under the title of *Lord Lieutenant*, holding almost regal sway. The Roman Catholic is the prevailing form of religion, excepting in Ulster, in which province Presbyterianism is largely in the ascendant. In 1870, the Anglican Church in Ireland, heretofore based on a similar foundation to that which it holds in the sister-kingdom, was disestablished by Act of Parliament, and all churches therefore made self-supporting.

Ireland is well supplied with educational institutions, having three universities—those of Trinity College, Dublin (Protestant), Maynooth (Roman Catholic), and the Queen's University—besides a large number of endowed schools, and an admirable system of mixed schools where children of all denominations may be taught. The legal executive is similar to that of England.

FRANCE

BEFORE the time of Cæsar, the whole of France was known to the Romans under the name of *Transalpine Gaul;* but after its conquest it was divided into the four provinces of *Provincia Romanorum* (Provence), *Gallia, Aquitanica, Celtica* and *Belgica.* In the fifth century the Germanic nations began to pour in an irresistible torrent over Gaul; but the Franks, in course of time, absorbed all the other tribes of that country, and Pharamond, their chief, in 420, is considered the founder of the French monarchy.

In 751 the Carlovingian dynasty, commenced in the person of Pepin le Bref, was carried to the zenith of its power and glory by Charlemagne, 768-814, and ended with Louis V. in 987. The Capetian race gave fifteen kings to France, beginning with Hugh Capet and ending with Charles V., 1328.

The house of Valois ruled France under thirteen kings, beginning with Philip VI. and ending with Henri III., 1589. In that year Henri IV. inaugurated the House of Bourbon. Louis XIII. succeeded in 1610; Louis XIV. in 1643; Louis XV. in 1715; and Louis XVI. in 1774.

In 1789, broke out that tremendous revolution which cost Louis XVI. his crown and head (1793), destroyed every vestige of the previous government and institutions, and inaugurated an era of periodical convulsions, which, unhappily for this country does not yet seem to have terminated.

Downfall of Napoleon.

The power was successively held by the Convention, 1792; the Directory, 1795; the Consulate, 1799; Napoleon I., who caused himself to be crowned emperor, 1804, and whose downfall dates from the great battle of Waterloo, 1815; Louis XVIII., the representative of the House of Bourbon, who was then restored to the throne by the aid of the Allied Powers; Charles X., who succeeded the latter in 1824; Louis Philippe I., of the Orleans branch of the Bourbons, who was raised to the throne after the revolution of July, 1830; the Second Republic, inaugurated after the overthrow of the last-named monarch in 1848; and Napoleon III., who, after the *coup d'etat* of 1851, was elected emperor.

In July, 1870, the latter declared war against Prussia; his armies were defeated in several battles, and himself compelled to surrender to the victorious enemy after the decisive battle gained by them before Sedan in September; and his dethronement was decreed by the French Assembly. The war was then unsuccessfully renewed by the Republican Government of National Defence; Paris, besieged by the Germans, resisted heroically its invaders for several months, but on the eve of being obliged to capitulate by sheer starvation, negotiations were entered into which resulted, in February, 1871, in a disastrous treaty of peace with Germany, by which France lost the portions of her territory included in Alsace-Lorraine, and had also to pay the enormous sum of $1,000,000,000 by way of indemnity, which indemnity, however, was paid in full much in advance of the stipulated period.

In March, 1871, a revolt broke out in Paris, headed by the leaders of the extreme Republican party, in conjunction with the Socialists. Under the name of the *Commune*, they inaugurated a dictatorial power in the French capital, and resisted the authority of the National Assembly; hence necessitating a second siege, more calamitous than the first

Presidents of the Republic.

On August 31, 1871, M. Louis Adolphe Thiers was nominated by the National Assembly President of the French Republic. In 1873 (May 24) he was suceeeded by Marshal MacMahon, and in 1879 by M. Grévy, who resigned in 1887, and was succeeded by M. Carnot.

On the 23d of June, 1894, President Carnot was assassinated at Lyons by an Anarchist. M. Cassimer Perier was elected President June 27th by the National Assembly. In January, 1895, he resigned his office and determined to retire to private life. On the 17th of the same month the Assembly elected as his successor, M. François Felix Faure.

France is notably an agricultural country. The high development of nursery-gardening has achieved most remarkable results in variety and richness of crops. It may suffice to say that, owing to their perfect methods of horticulture, the farmers around Paris and other large cities succeed in obtaining vegetables and fruit to the value of from $300 to $800 per acre. The planting of trees and the reclamation of unproductive soil go on in various parts of France on a large scale. Special interest is taken in cattle-raising, and

fine breeds of horses are reared in the North and Northwest. In some parts of the country wool-growing is an extensive industry. The exports of cattle, butter, eggs, cheese and poultry, especially to England, are very considerable—no less than 70,000,000 pounds of butter and 1,000,000,000 eggs being sent every year across the channel.

France is very rich in all kinds of building stone, gravel, chalk and plaster, and this circumstance has permitted her to build most of her cities of excellent stone.

THE GERMAN EMPIRE

FROM all that can be collected of the early history of Germany (called *Germania* by the Romans), it appears to have been divided into many petty nations and principalities, many of which frequently united under one head or general, both in their offensive and defensive wars. The Germans maintained a long and aggressive warfare against the Romans, but were at length kept in check by Germanicus.

The Romans, nevertheless, prudently contented themselves by making the Rhine and the Danube the boundaries of their conquests; they accordingly built fortresses on the banks of both those rivers, to prevent the incursions of what they termed the barbarous nations; but within about a century after Constantine the Great, the Franks, Burgundians, Alemanni, and other German nations, broke through those boundaries, and dispossessed the Romans of all Gaul, Rhætia and Noricum, which they shared among themselves; but the Franks prevailing over the rest, at length established their empire over all modern Germany, France and Italy, under the conduct of Charlemagne.

At the demise of this great monarch, Germany became again dissolved into constituent states until 843, when the kingdom of Germany arose under the sovereignty of Louis le Debonnaire. After being governed by the Carlovingians till 887, the monarchy became elective in 911, in the person of Conrad I., Duke of Franconia; a Saxon dynasty succeeded in 918, and afterward resuscitated the empire under Otho the Great, under the title of the *Holy Roman Empire of the German Nation.*

The Throne at Last Established.

Under the Suabian dynasty, 1138-1190, the imperial power attained its zenith. Then came the aggressions of the Popes, the feuds of the great vassals of the crown, and the state of anarchy consequent upon the struggle between the Guelphs and the Ghibellines, succeeded by an interregnum lasting from 1254 to 1273. In the latter year the empire became reconsolidated by Rudolph of Hapsburg, and the throne first placed upon a firm basis.

In 1438, the House of Austria commenced its long career as Emperor of Germany, and reached its acme of power and prosperity under Charles V. and his immediate successors. The Thirty Years' War, 1618–48, then supervened to disintegrate the empire, establish the Lutheran religion, and give to France the political ascendancy on the continent of Europe. For several

CHARLEMAGNE AND HIS NOBLES.

after generations, wars with the last-named power culminated, in 1740, in the War of the Austrian Succession, which raised the House of Lorraine to the imperial throne in the person of Francis I.

At length, in 1804, the ancient German empire came to an end, beneath the blows of Napoleon I., by the abdication of Francis II., who, retaining only his hereditary territories, became the first Emperor of Austria. Ages anterior to this consummation, Germany had been politically transformed (so to speak) by the great princes, vassals of the empire, into a semi-independent confederacy of petty states, represented in the diets. The free cities also shared in the distribution of political power, and finally resolved themselves into the Hanseatic League.

The Historic Ten Circles.

Prior to the French Revolution, 1789, the empire had become politically distributed into ten *circles*, each circle embracing the states of one or more powers—regal, ducal, electoral, ecclesiastical or municipal. The provincial diets of these circles were subject (at all events nominally) to the imperial diet convened and presided over by the emperors.

In 1805, Napoleon I., in pursuance of his designs for the disintegration of the German power as a unity, enlisted on his side certain of the circles and electoral powers, which he combined into a body called the *Confederation of the Rhine*. He also created for his brother Joseph a kingdom out of the Lower Rhine provinces, under the name of Westphalia. In 1809, too, he succeeded in absorbing into the French Empire the seaboard provinces of the old regime, and divided them into departments after the French manner. In 1813, however, the *Liberation War* broke out, and terminated in the redemption of the country, and the expulsion of the foreign invaders.

The Congress of Vienna, 1815, divided Germany into thirty-nine sovereign states; which number became by various after causes reduced to thirty-four, at which it stood prior to the Austro-Prussian war of 1866, which eliminated Hanover and several other secondary states from the German political map, and extinguished Austrian influence in Germany proper. Prussia hence became the one recognized ruling power in that country, and assumed the leadership of the states of North Germany, united under the title of the *North German Confederation*.

Grand Military Alliance.

In addition, she further increased her political influence, or rather preponderance, by entering into treaties with the South German powers of Bavaria, Würtemberg and Baden, providing for a strict international military alliance—offensive and defensive—and the placing of the armies of those powers at the disposal of the German nation, as represented by Prussia, in time of war. The practical results of this wise and astute policy bore fruit in the achievements of the united German armies in the campaign against France, 1870–1: and the restoration of national unity, in the rehabilitation of the Germanic Empire of Barbarossa and Charles V. in the person of William I., King of Prussia.

In 1888, a serious illness of Emperor William resulted fatally, March 9th, and his son, Prince Frederick III., came to the throne. His death followed on June 15th, and he was succeeded by his son, Emperor William II. On April 24, 1895, the German Government, in connection with Russia and France, protested against the acquisition of Chinese territory by Japan. On June 19th, the opening of the Baltic Canal was celebrated

by the Germans with the warships of all maritime nations as guests. The occasion called forth congratulations for Germany from many other governments whose representatives participated in the festivities, and was regarded as a peaceful demonstration intended to afford opportunity for the European nations to express their good will.

AUSTRO-HUNGARIAN EMPIRE

TOWARDS the close of the 8th century the Emperor Charlemagne founded a jurisdiction in Lower Austria, which became a duchy in 1156 and an arch-duchy 300 years later. In 1564, Maximillian II., son of the great Emperor Charles V., became Emperor, with Austria, Hungary and Bohemia for his possessions. But many years elapsed before the whole of Austria was united under one government.

In the 18th century it attained rank as one of the great powers of Europe, and up to a recent date its influence was all-powerful in Germany. Until 1806 its rulers bore the title of Emperor of the Romans, but in that year the Emperor Francis renounced that title and became the first Emperor of Austria. From 1806 to 1813 Austria was menaced by the ambitious Napoleon, but made such bitter armed patriotic resistance to the inroads of this almost invincible warrior, that the French victories were shorn of much of their glory. The peace of Vienna (October 14, 1809) took from Austria large possessions.

But these were restored by the Congress of Vienna (1815) after the defeat of Napoleon at Waterloo, together with Lombardy and Venice, the Illyrian provinces, Dalmatia and the Tyrol. The close of the reign of Francis I. was marked by several insurrections amongst the Italian provinces, and it was with the utmost difficulty that the confederation was maintained. The Emperor died in 1835, and was succeeded by his son, Ferdinand I., a weak-minded prince, who entrusted the government almost entirely to Metternich. The French Revolution (1848) caused the Austrian Empire to totter to its foundations. The revolutionary spirit manifested itself everywhere, resulting in the abdication of the Emperor in December, and the imperial honors were conferred upon his nephew, Francis Joseph.

The Two Months' War.

In 1859 diplomatic complications led to a rupture of relations with France, which was followed by warfare, for two months, until in July the two Emperors, Napoleon III. and Francis Joseph, consummated the peace of Villafranca, Austria giving up Lombardy, Italy to be formed into a confederation under the presidency of the Pope, and Modena and Tuscany to be restored to their princes. The first constitution of Austria was promulgated in 1860, followed by a patent in 1861, which formed the basis of a charter that went into effect in 1867, with certain modifications rendered necessary by the recognition of Hungary's independence. In 1864 Austria joined Prussia in hostilities

upon the Danish duchies of Schleswig, Holstein and Lauenburg, and the war terminated in their acquisition.

But Austria speedily suffered terrible retribution for the part she had taken in the affair, the difficulty in disposition of the provinces bringing on war with her former ally. The Italians acted in concert with Prussia in hostilities upon Austria, and what is called the Seven Days' War ended in the Prussian victory at Königgratz, which led to peace negotiations at Prague, where a treaty was signed August 23d.

By this treaty Austria was shorn of Venetia and the fortresses of the quadrilateral, the dissolution of the German Confederation was recognized, all claim to Holstein and Schleswig was given up. The necessity of self-government for Hungary was recognized, and on June 8, 1867, Francis Joseph was crowned King of Hungary, in addition to his title as Emperor of Austria. A treaty of alliance with Germany and Italy was signed Mch. 13, 1887. A defensive treaty with Germany against Russian or other aggressions was made Oct. 7, 1879, but not published until Feb. 3, 1888. Archduke Rudolph, heir to the throne, committed suicide Jan. 30, 1889. In Dec., 1893, a commercial treaty was formed with Spain. The jubilee of Emperor Francis Joseph was celebrated in May, 1898.

THE RUSSIAN EMPIRE.

HISTORY records the fact that the Scythians and Sarmatians of the country bordering on the Don and Dnieper, were known to the Greeks and Romans of old, as they are mentioned by Herodotus, Strabo and Tacitus. In the earlier centuries of the Christian era successive invasions of Goths, Huns, and other warlike peoples swept over the land, and either drove out or absorbed the native inhabitants. At this point we find the first mention of the Slavs, who drove the scattered Finnish tribes to the far north and became the founders of the Russian people and government. There stands in Novgorod a splendid monument which was erected in 1862 on the millennial anniversary of the foundation of the Russian Empire by Ruric the Norman.

But for many centuries the country was divided into practically independent provinces, some of which retained their autonomy up to a very recent period. The empire was divided and again united; it was broken into four parts; became a confederacy, and again, under Ivan III. (1462–1505), became a nation.

Christianity was introduced about the year 950, and two centuries later the greater part of the empire was overrun by the Mongols. From 1380 to 1470 tribute was paid to the Tartars, but Ivan the Great broke their power and his son and successor, Ivan the Terrible, contributed much to the greatness of Russia.

Under Peter the Great, the fourth monarch of the Romanoff dynasty, Russia emerged from barbarism, the boyars (noblemen) lost their influence, and the country assumed

CATHARINE THE GREAT AT THE HEAD OF HER ARMY.

the position which it has ever since retained as a leading member of the European family of nations. Since the time of Peter its national policy has been directed to the acquirement of additional European and Asiatic territory, and every reign has seen vast possessions added to this already enormous power.

Russia become involved in the general European wars of the first fifteen years of this century, and destroyed its most renowned city, Moscow, that it might not afford shelter to the hated invader, Napoleon. All efforts of the various nations which have at one time or another been absorbed by Russia to regain their independence have been barren of results; she never gives anything back.

Russia's Onward March.

Although her schemes of aggrandizement on the Black Sea were temporarily checked by the war of 1854–55, in which England, France and Sardinia supported the Ottoman Empire, Russia has since made greater strides east and south, and has almost attained her chief aim, the full and unrestricted control of the Black Sea. She presses England upon the line of the Himalayas, and China finds its great wall an insufficient defence against the disciplined legions of this great power.

Properly speaking, Russia is an Asiatic power with great possessions in Europe rather than a European power with subject provinces in Asia, and its march has been and continues to be in a directly opposite line to the ordinary movement of population and empire, which is westward.

There was much domestic disturbance in Russia during the years 1891 and 1892, in the former of which the country was distressed by poor harvests and famine in some localities, while in the latter year cholera carried off a quarter of a million persons. On November 1, 1894, occurred the death of Czar Alexander III. at Livadia, aged 49. Notwithstanding this recent death in the royal family, on the 26th of the same month, Czar Nicholas II. wedded the Princess Alix of Hesse-Darmstadt.

Her Power Felt Everywhere.

For a long time the influence of Russia has been paramount in the politics of eastern Europe and some parts of Asia. No sooner had Japan gained her brilliant victory over China in 1894 than the power of Russia began to manifest itself in the settlement of the terms demanded by the Japanese Government. In the early part of 1896 the same strong influence was brought to bear upon the Turkish question, which then was agitating the world on account of the Armenian Massacres, putting an effectual check upon English diplomacy.

The public income of Russia for 1895 was estimated at 1,214,378,030 roubles, having almost doubled since 1883. The internal taxes are collected in paper, but much of the customs dues are paid in gold. The value of the paper rouble is about fifty cents in our money, while the gold rouble is valued at about seventy-seven cents. But as only about one-tenth of the revenue is from customs, it is safe to put the yearly income of the government at a little over $600,000,000.

The exports of Russia to foreign countries consist principally of corn, flour, butter, eggs, flax, timber, linseed, raw wool and illuminating oils. The chief industrial centres are Moscow and the surrounding governments, St. Petersburg and Poland. The woolen trade is taking firm root in the South, chiefly through English capital and enterprise. The domestic industries carried on along with

agriculture are of great importance and a source of livelihood to vast numbers of the peasantry The empire is very rich in all kinds of minerals, and its mining industry has of late years begun to advance with rapid strides and is full of promise.

NORWAY AND SWEDEN

NORWAY'S authentic history begins with A. D. 863–933, when Harold Harfager, or Fair-Haired, subdued the petty kings and united the tribes as a nation. Olaf I., who came to the throne in 995, destroyed the pagen temples, and laid the foundation of Trondhjem. In 1028 Canute the Great, of Denmark and England, drove Olaf out and became King. Then commenced a series of wars with Britain, followed by an invasion of Ireland. A warlike nation, they became noted for their prowess by water, and were a terror to the nations about them.

In 1262 the national prosperity of Norway began to decline after the defeat of Haco V. at the mouth of the Clyde, and his subsequent death in the Orkneys. Wars with Denmark exhausted the country's resources, national industries were checked, and the plague broke out in 1348 and ravaged the kingdom for more than two years, destroying two-thirds of the population. Centuries elapsed before this condition of decay was thrown off. The country not only lost its nationalty, but also its proper language, which finally became a corrupt mixture of those of its neighbors.

In 1380 the crown descended to the son of Olaf III., King of Denmark, and from that period down to 1814 these two countries were united. Margaret succeeded her son, Olaf III., reduced Sweden, and joined the three kingdoms under one monarch, under what is historically known as the "Union of Calmar." Gustavus Vasa severed this union with Sweden in 1523, and for two centuries Norway was scarcely more than a province of Denmark. About the beginning of the present century a better day dawned on Norway.

Union of the Two Countries.

After a series of dissensions and diplomatic complications, Russia, which had been engaged in warfare with Napoleon, indemnified Sweden for the loss of Finland—which on a former occasion Napoleon had signed away to Russia, without warrant—by the presentation of Norway, to which Sweden had no title. In 1814 the Danes acknowledged Norway as a dominion of Charles XIII. of Sweden, but a Danish prince, Christian, attempted to set up an independent sovereignity, but was compelled to abdicate, and on August 14th of the same year, Norway and Sweden were formally united, the ratification by the Storthing settling the matter on the 20th of October.

From this time the government became more and more liberal, titles of nobility were abolished, and the people styled citizens. In

1855 there was a good deal of anxiety felt over the encroachments of the Russian Government, and Norway, Sweden, England and France entered into an alliance in which "the two Scandinavian powers promised never to cede or sell territory to Russia, or to any other power, without the consent of England and France," and by this they received a guarantee of future territorial integrity under protection of the last named powers.

The modern history of Sweden follows somewhat in the pathway of its neighboring kingdom, Norway. After the establishment of the "Union of Calmar" (1397) by Margaret of Denmark, the three countries of Norway, Sweden and Denmark were kept together with great difficulty for 100 years. In 1520, Christian II. of Denmark became King, and so exasperated the people that they rose in revolt, with Gustavus Vasa at their head and their resistance to the government of the Danish King was so successful that, in 1523, Gustavus was made King of Sweden.

The country entered on an era of prosperity, and was governed in a manner more pleasing to the people, though the successors of Vasa attempted some radical changes which did not meet with general favor. The reigns of the sovereigns from 1600 were marked with almost constant warfare against adjoining kingdoms.

In 1741 Sweden was defeated in a war with Russia, and in 1743 East Finland was yielded to the conqueror. Following this, came a war with Prussia which was disastrous in the extreme. Again in 1787 Sweden was involved in a war with Russia and Denmark. In 1809 a new constitution was decreed. During the Crimean War neither Norway nor Sweden took any part therein. Of late years Sweden has prospered and made great improvement in manufactures, arts and sciences.

DENMARK

DENMARK has always exerted an influence in the affairs of Europe out of proportion to her size and military strength. Her authentic history dates from 1385, the year of the accession of Margaret, the "Semiramis of the North," and wearer of the triple Scandinavian crowns. After her glorious reign, Sweden, after a lengthened contest, succeeded in asserting her independence.

In 1658 Denmark was invaded and despoiled of some of her most important territories by the "Lion of the North," Gustavus Adolphus. In 1807 a British fleet under Lord Nelson bombarded Copenhagen and destroyed the Danish navy, and in 1815 Norway was transferred to Sweden, Denmark receiving in exchange the insignificant duchy of Lauenburg, with a money indemnity; a work of spoliation consummated in 1864 by the forcible acquisition of the Schleswig-Holstein duchies by Prussia, after a short but sanguinary struggle, in which the latter power, with the aid of Austria, overcame the brave Danes by sheer force of numbers.

In 1863 died Frederick VII., the last monarch of the House of Oldenburg, who was succeeded by the present King, Christian

IV., of Schleswig-Holstein-Sonderburg-Glücksburg.

The peaceful relations already existing between Denmark and England were confirmed by the marriage of Princess Alexandra of Denmark to the Prince of Wales, at Windsor, March 10, 1863.

When the war broke out between Austria and Prussia, in 1866, and resulted in the humiliation of Austria, the hope of Denmark that a part of her original territory, which, as already stated, had been acquired by Prussia, was frustrated. Notwithstanding her dismemberment, Denmark has prospered to an astonishing degree, and her material fortunes have been constantly in the ascendant. Her only trouble within the last decade has arisen from the dissensions in the two houses of Assembly and in the spread of dangerous communistic opinions.

The Government of Denmark is a constitutional monarchy, the King being assisted by a cabinet of seven ministers. Elementary education is widely diffused and attendance at school is compulsory for children between the ages of seven and fourteen years, poor parents paying only a nominal sum toward the government schools, of which there are about three thousand. The established religion is Lutheran, to which the King must belong, but complete toleration is enjoyed in every part of the kingdom. The present King of Greece is a prince of the royal house of Denmark.

HOLLAND--THE NETHERLANDS

BY the revolution of 1830, Holland, or the Netherlands, was separated from Belgium. The earliest accounts of the Netherlands are from the Romans, by whom all the southern and central part (called Belgia) was kept in subjection till the decline of their empire in the fifth century. It was formerly under the government of counts, but being incorporated with the extensive possessions of the Duke of Burgundy, the Netherlands passed to Maximilian of Austria, father of Charles V., who united the seventeen provinces into one state; but the bigotry of his son Philip II. produced the separation of the Dutch provinces, and great dissension and distress in the others.

They remained under the Spanish crown until the middle of the seventeenth century, when arduous exertions were made by Condé and Turenne to add them to the dominions of Louis XIV. The quadruple alliance, concluded at the Hague in 1668, however, put a stop to their progress, but the wars from 1672 to 1679, and 1680 to 1697, were prosecuted chiefly for the Netherlands. At length, in 1702, Louis obtained them, but the French being defeated by the Duke of Marlborough at the battle of Ramilies, in 1706, the southern provinces were brought under the power of the allies, and assigned to Austria at the peace of Utrecht.

A peace ensued, until the war of 1741 was transferred to the Netherlands, and the French under Marshal Saxe recovered them.

Bergen-op-Zoom was captured by the French in September, 1747, and Maestricht in the following year, when the successes of the British navy, and the persevering aspect of the coalition, led to the peace of Aix-la-Chapelle in 1748, and the southern Netherlands thus became restored to Austria. By the treachery of Austria in 1756 they were once more nearly ceded to France, but the scheme was not carried into effect.

In the campaign of 1792 Austria again lost the Netherlands, and though recovered in 1793, they again passed over to France in 1794. The hope of recovering them was the cause of the coalition of 1799 and 1805, both baffled in their object. The disasters of the French army in Russia in 1812, at length opened the long-wished-for prospect. In 1813 Germany occupied all the exertions of the allies, but in 1814 the Netherlands were detached by a consequence of the revolution by which the Bourbons were restored; and the British Cabinet accomplished the union of the seventeen provinces, and their erection into an independent state, under the Prince of Orange, in 1815. The Prince, therefore, assumed the title of King of the Netherlands and Grand Duke of Luxembourg.

VIEW OF DORT.

The bill for the emancipation of the slaves in the Dutch West Indian possessions, passed in 1862, decreed a compensation for each slave and came into force in 1863. The expenses of this emancipation came to $5,065,366, and the number of slaves set free was about 42,000, of whom 35,000 were in Dutch Guiana.

The present King having no living male issue, the succession to the crown was vested in the Princess of Orange, Wilhelmina, the only child of King William's second marriage, born in 1880. Of late years the great question of internal politics has been the new constitution, which was duly promulgated November 30, 1887. This act increased the electorate of Holland by no less than 200,000 voters. A revision of the school laws in a sectarian sense was carried early in December, 1889. Meanwhile, in 1888, the Queen, Emma of Waldeck, had been appointed regent in the event of the King's demise, and a council of guardians named to assist her in the education of Princess Wilhelmina.

Many industries are carried on, and the country has a large percentage of skilled artisans. Amsterdam has had the largest diamond-cutting trade in the world, ten thousand persons depending on that branch of industry, although in recent years it has been on the decline.

The Dutch were once called the "Carriers of Europe."

Wilhelmina, Queen of the Netherlands, attained her majority and came to the throne on August 31st, 1898. The regency of her mother ceased at this time; it had continued from November 23, 1890. On Feberuary 7th, 1901, the Queen was married to Duke Henry of Mecklenburg-Schwerin.

BELGIUM

IN the time of the Romans, Belgium was included in Gaul, and was known as *Gallia Belgica*. The people were mostly Celts, but while under the rule of the Franks, in the 5th and 6th centuries, by irruptions from the North the principal element of the population became German.

The country was afterwards divided into a number of independent duchies, counties and free cities, the principal of which was the County of Flanders. The male line of the Counts of Flanders became extinct in 1385, and their possessions passed into the hands of the Dukes of Burgundy, who soon after obtained the whole of the Netherlands

By the marriage of Mary of Burgundy with Maximilian in 1477, the Netherlands came into possession of Austria. Maximilian was succeeded by his son Philip, who married Johanna, daughter of Ferdinand and Isabella of Spain, in 1496.

Holland, the northern portion of the Netherlands, established its independence, while the southern portion, Belgium, continued under the rule of Spain, Philip ceded Belgium to his daughter, Isabella, and her husband, the Archduke Albert, in 1598, under whom it formed a distinct and independent kingdom. Albert died in 1621 without issue, and the country again fell into the hands of Spain.

Between 1659 and 1697 Belgium lost considerable territory in the wars between Spain and France and Holland. By the treaty of Utrecht in 1713, Belgium was assigned to Austria. During the war of the Austrian succession almost the whole country fell into the hands of the French, but by the peace of Aix-la-Chapelle it was restored to Austria, 1748. In 1790 the provinces of Belgium revolted against Austrian rule, and formed themselves into an independent state under the name of United Belgium. They were, however, subdued by the Austrians in the end of the same year.

Austria's Power Overthrown.

In the war with revolutionary France the battle of Fleurus (1794) put an end to the Austrian rule in Belgium. In 1815 it was united with Holland under Prince William Frederick of Nassau. Belgium revolted in 1830, declared itself an independent state and chose Leopold, Prince of Saxe-Coburg as its king, in 1831. The five great powers afterward determined the limits of the territory, making Holland and Belgium separate kingdoms. Leopold died in 1865, and was succeeded by his son, Leopold II., the present monarch.

On the outbreak of the Franco-German war in 1870 the Belgians, fearing risks both from Prussia and from France, mobilized their army ; but in a special treaty arranged by England, both belligerents recognized anew the neutrality of Belgium, guaranteed in 1831 and 1839. In 1885 the Congo Free State, under the presidency of Leopold II., was acknowledged by the powers.

Although the country has, on the whole, steadily grown in prosperity, and constitutional principles have been generally strengthened, yet 1886-87 witnessed industrial riots and Socialist disturbances of a serious aspect, attended at Liege, Mons. Charleroi and other places with great violence. The King, at the opening of the Chambers in November, promised that measures of reform should be introduced, and this had the effect of quelling the disturbances. In 1880 the jubilee of the state was celebrated with enthusaism.

King Leopold has distinguished himself by being the patron of Henry M. Stanley in his African explorations, having rendered material aid to the explorer.

The government is a constitutional hereditary monarchy, the members of the House of Representatives being elected by citizens who pay not less than twenty florins annually in direct taxes. The King can convoke, adjourn or dissolve the Senate and House of Representatives at pleasure. Under the mild and successful government of Leopold, the country has prospered, and the people seem attached to their King and constitution, and are peaceful and contented

SWITZERLAND

SWITZERLAND, the ancient *Helvetia*, became, under the Roman empire, a semi-civilized country, and, after the fall of that power, passed in succession under Burgundian, Frankish and Germanic sway. In 1307 a movement of the three northern cantons of Schwyz, Uri and Unterwalden inaugurated the ultimate overthrow of Austrian rule in the result of the battle of Morgarten in 1315.

During the two following centuries the other cantons fell one by one into the arms of the Helvetic Confederation, which latter, however, did not obtain its solidarity as a European power until the peace of 1814.

In 1815 the perpetual neutrality of Switzerland and the inviolability of her territory were guaranteed by Austria, Great Britain, Portugal, Prussia and Russia, and the Federal Pact which had been drawn up at Zurich, and which included three new cantons, was accepted by the Congress of Vienna. The Pact remained in force till 1848, when a new constitution, prepared without foreign interference, was accepted by general consent. This, in turn, was, on May 29, 1874, superseded by the constitution which is now in force.

Following the new constitution of 1848 came the revolt of Neufchâtel against Prussia, to which country it had belonged, and its reception into the Swiss Confederacy

as a canton on an equal footing with the rest. During the Franco-German war of 1870–71 the landwehr were called out as a measure for the maintenance of Swiss neutrality.

The sublime scenery of the Alps draws tourists to Switzerland from all parts of the world and renders this remarkable country a constant and general object of interest.

ITALY

ITALY, since the downfall of Rome, has been divided into different states, and has lost that power which it formerly enjoyed. Its historical remains, its schools of art, its delicious climate, give it an undying interest. It has been called the garden of Europe; and the panegyric which Pliny bestows upon it does not seem in any degree exaggerated.

The ancient inhabitants called themselves Aborigines, offspring of the soil, and the country was soon after peopled by colonies from Greece. Italy has been the mother of arts as well as of arms, and the immortal monuments which remain of the eloquence and poetical genius of its inhabitants are universally known. The early part of the history of this country is, however, involved in the greatest obscurity. The first light thrown on this land of darkness was by the settlement of Greek colonies in the south, where, eventually, a large tract of country was called Magna Græcia. The annals of Rome are said to go back 750 years B. C.

Italy continued subject to one power for more than 800 years; until the fifth century, when the Goths crossed the barriers of the Alps. Toward the year 560 A. D. the Lombards entered the north of Italy, took Milan and Pavia, and founded a kingdom which continued during two centuries, until overthrown by Charlemagne.

Prolonged Military Struggles.

After his death Italy belonged to his successors on the imperial throne, but their tenure was precarious, the great barons laboring to assert their independence and the popes to extend their temporal dominions. The subsequent history is little more than a succession of military struggles, of little interest, until 960, when Otho I. repaired, in person, to the north of Italy, granted municipal rights to the cities, and improved the interior government in general.

The whole was united to the German Empire; but from this compact fresh feuds and commotions followed; the Italian nobility were jealous of their privileges; conspiracies were formed, detected and suppressed, and no constant allegiance was exhibited to the German Government or the magistracy put into authority by it.

A series of wars continued for several ages. In the fourteenth century Italy was divided into the kingdom of Naples, the estates of the Church, Tuscany, Parma and Lombardy, the Genoese and the Venetian territories and other petty states. For two centuries the Venetians and the Genoese

were the most considerable commercial people in Europe, and Venice, in particular, possessed large foreign colonies, and in 1194 took Constantinople and held in sovereignty portions of what now constitutes Turkey in Europe and Greece.

The foundation of the temporal power of the popes was laid about 1080, by Matilda, Countess of Tuscany, who bequeathed a large portion of her dominions to Pope Gregory VII. After that time the popes successively made great acquisitions of territory; but in 1798 Rome was taken by Berthier, and Bonaparte annexed the papal dominions to France. They were, however, restored in 1814.

In March, 1860, Savoy and Nice were ceded to France, to which they are still attached. Garibaldi and his volunteers conquered the Two Sicilies, Francis II. of Naples fled in terror, and the end of the great popular uprising was that in March, 1861, Victor Emmanual of Sardinia was proclaimed King of Italy. The Austrians held Venice until 1866, when Italy and Prussia united their forces against her. Rome remained in the hands of the French until the outbreak of the Franco-German war, in spite of the abortive revolutions instigated by Mazzini and Garibaldi.

Finally, on September 20, 1870, the national forces entered Rome, which became at

NAPLES, SHOWING MOUNT VESUVIUS IN THE DISTANCE.

last the capital of United Italy. Victor Emmanuel was succeeded in 1877 by his son Humbert. The Pope still resides in Rome, but has no jurisdiction except within what is known to Italy as the "Leonine City." Parliamentary government has been accorded in the fullest degree.

The defeat of the Italian army in Abyssinia, March 2, 1896, caused great excitement at Rome.

King Humbert I. was assassinated July 29, 1900, and his son, Victor Emanuel, prince of Naples, born November 11th, 1869, came to the throne.

SPAIN

SPAIN, after being partially colonized by the Phœnicians and Carthaginians, became a Roman province under Augustus, and some 400 years afterward was successively overrun by the Vandals, Goths and other northern races. In the eighth century the Moors successfully invaded the country, and remained virtual masters of the entire Spanish portion of it till the reign of Ferdinand and Isabella, when, in 1492, they were finally driven back into Africa.

Under Charles V., and his son Philip II., Spain became the greatest power in the then world. But with the latter prince began that decay which speedily reduced it to a mere shadow of its past glory and importance. After the death of Charles II., in 1700, began the so-called *War of the Spanish Succession*, in which the rival claims of France and Austria to the throne terminated in favor of Philip V., grandson of the French King Louis XIV.

Between 1759 and 1763 an unsuccessful war was waged against England, and in 1778 Spain again took up arms against that country, and at the peace of 1783 received the island of Minorca and the American Floridas.

The later chief events in Spanish historical annals have been: The struggle against Napoleon during the so-called *Peninsular War;* the restoration by French arms, in 1823, of the Bourbon dynasty in the person of Ferdinand VII., whose tyranny had led to a revolution in 1820; the *Carlist War*, 1833-40, ending in the triumph of the Christinos; the exile of Queen Christina in 1854; a war with Morocco in 1858-9; the annexation of St. Domingo in 1861; a war with Peru and Chili in 1864-5; the downfall of the Bourbon monarchy in 1868; the insurrection in Cuba in 1868-75; the election of Amadeus of Savoy as King of Spain in 1870; his abdication in 1873; the adoption of a republican form of government under Castelar and Serrano, 1873-4; and the restoration of the monarchy in the person of Alfonso XII., son of Isabella, January, 1875. Spain, from 1873 to 1875, was the theatre of a civil war waged against the government by the adherents of Don Carlos, who held nearly all the northeast of the country.

In 1898 war broke out between the United States and Spain. The battleship Maine was blown up in the harbor of Havana, and this act had much to do with the outbreak of hostilities. The sympathies of the United States were with Cuba in her struggle for independence, and the ultimate result of the war was the overthrow of Spanish rule and inhuman oppression in that island.

Admiral Dewey destroyed the Spanish fleet in the harbor of Manila, our Atlantic squadron destroyed the Spanish fleet at Santiago, and our land forces captured the town. A treaty of peace was signed in November, 1898.

PORTUGAL

UNDER its ancient name of Lusitania, Portugal was constituted a Roman province under Augustus, and so remained till the fifth century, when it became subject to the Visigoths. In the eighth the Moors took possession of the country and held it for four centuries, at the end of which period they were driven out by Prince Alonzo Enrique, of Castile, who thereupon was elected King. Under the dynasty he founded Portugal made rapid progress, and under John I., and in the reigns of John II. and Emanuel, 1481–1521, became eminent as a maritime and colonizing power, establishing settlements in the East and adding Brazil to her dominions.

Under Sebastian III. began that fruitless crusade against the Moors which cost that monarch both his life and crown. Later, Portugal became a dependency of Spain, but in 1640 she threw off the yoke and placed the Braganza dynasty on the vacant throne. In 1807, after the deposition of the royal family by decree of Napoleon, Dom Pedro, the King, withdrew to Brazil, of which country he became first Emperor.

The Government is a limited monarchy, and the Legislature, known as the *Cortes*, consists of two houses—one of Peers, the other of Deputies. The Roman Catholic is the state religion, but entire toleration with respect to others prevails.

A Steady Decline.

For many years the financial condition of Portugal has gone steadily from bad to worse. The rush of the European powers to appropriate African soil awakened, for a time, her old spirit and ambition, but the awakening came too late. The march of events and the energy of her rivals have wrested from her many square miles that she claimed as her own, but had done next to nothing to colonize and develop. England in the end of 1889 compelled Portugal to abandon her claims to Nyassaland, and two years later a treaty was signed defining the

respective spheres of influence of the two countries in East and West Africa, especially in the basin of the Zambesi. Further delimitations were agreed upon in 1891.

In the meantime Charles I. had succeeded his father, October, 1889. The action of Britain occasioned an outburst of strong popular feeling in Portugal, which the republicans turned to their own advantage, and they were greatly helped by the successful revolutions of the republicans in Brazil and the expulsion of the Emperor, November 1889. But in the home country their advantage proved to be only temporary.

GREECE

GREECE shares with Rome the absorbing interest of ancient classic story. Glorious in arts and arms, renowned for her temples and mythology, her warriors, poets and statesmen, her controlling influence at one time in the affairs which make up the annals of ancient nations, she is at once the admiration of the scholar, the artist and the historian. Her classics have come down to us with all the charm of learning and romance and have long been the study of the most cultured classes of modern times.

The earliest settlers in ancient Greece were the Pelasgi, who were in course of time replaced by the Hellenes, a people which consisted of four tribes, namely, the Æolians, Dorians, Ionians and Achaians. Colonists from Phœnicia and Egypt followed the Hellenes, and joined with them in extending their united sway over the country. About 2000 B. C. the great cities of Athens, Sparta, Thebes, Argos and Corinth sprung into existence, and became in course of time the centres of political governments of a democratic form, and of a progressive advancement in civilization, education and artistic refinement. Their commerce embraced within its scope the ports of Gaul and the Mediterranean, at the same time that their naval and military power became extended in a corresponding ratio.

Philip of Macedon.

Civil discords, however, originated the Peloponnesian War, B. C. 434–404, by which their union of interests became broken up, and rendered Greece a prey to foreign invasion under Philip of Macedon, who, after the battle of Cheronæa, B. C. 338, became master of the country. Afterward, by the disruption of the Achaian League, Greece became a Roman province, 146 B. C. Then followed the decline and ultimate extinction of the glories of Greek art and civilization.

Invasions by the Goths, Vandals and Normans succeeded one another in turn till 1261, when the whole country—except Athens and Nauplia—became merged in the Greek Empire of Michael Palæologus. The Turks took possession in 1481, but their tenure of the country was contested for a period of two centuries by the Venetians,

until finally it was definitely secured to them by the treaty of Passarovitz.

In 1821 a revolution broke out against the Ottoman yoke, and the independence of Greece was secured by the interference of foreign powers, after the defeat of the Turks at Navarino, 1827. After a brief provisional government under Count Capo d'Istria, Greece was made into a monarchy by the protecting powers, and Otho, of Bavaria, placed on the throne in 1832. He reigned till 1863, when he was dethroned and the crown conferred upon George I., a prince of the reigning house of Denmark.

TURKEY

NO reputation less enviable belongs to any nation of the globe than that of Turkey. "The Unspeakable Turk" has long been an object of suspicion and hatred by reason of political intrigues, violation of sacred oaths, the rapacity that characterizes the savage, and the universal sentiment, amounting to a tyrannical law, which subjects everything to the reign of the Mohammedan religion. The most recent history of Asia is dark with the crimes and massacres that have made Armenia the theatre of wholesale slaughter, such as perhaps is unparalleled in all the annals of time.

The Ottoman Empire, properly speaking, comprehends all the countries in which Turkish supremacy is directly or indirectly recognized, and it includes some of the most beautiful as well as most ancient sections of the globe, in point of civilization. As a whole, the empire is an aggregation of governments, often widely separated, and only united by having been the subjects of a common conquest.

The Turks are first noticed in history about the year A. D. 800. They came originally from Asia and are of Tartar origin. They captured a portion of Armenia, which they called Turcomania, and in a short time pushed their dominion to the Hellespont, and finally obtained a foothold in Europe. The petty states into which their dominions were at first divided were united under Othman, one of their chiefs, in 1289. After him came his son, and then his grandson, Amurath, who established the Janizaries in 1362, a powerful and well-disciplined army, composed of youths selected from his Christian captives. He conquered the greater part of Thrace, and made Adrianople his capital.

His successor, Bajazet I., conquered the greater part of the Eastern or Greek Empire and besieged Constantinople; but being summoned to Asia to stop the encroachments of Tamerlane, he had to abandon the siege. Bajazet assumed the title of Sultan,

his predecessors being known by that of Emir. In 1453, Mahomet II. took Constantinople and made it the capital of the Turkish or Ottoman Empire. His grandson, Selim I., conquered Syria and Egypt, and Solyman the Magnificent, annexed the greater part of Hungary and extended the Turkish dominions in the East.

The Turks Defeated.

From the reign of Solyman the power of the Ottomans continued unabated till 1683, when John Sobieski, King of Poland, defeated the Turks and drove them out of Austria and Hungary. Thenceforward the power of Turkey continued steadily to decline. By the peace of Carlowitz, in 1699, Austria, Venice and Poland received back the territory previously wrested from them by Turkey.

During the eighteenth century Turkey was engaged in an almost uninterrupted series of wars with Russia, the result of which was seriously detrimental to the Turkish interests. Russia secured the Crimea and Azov, and the River Dniester was made the boundary between the two empires.

The Greeks rose in rebellion in 1821, and adopted an independent provisional constitution in 1822. The manly efforts made by the Greeks in face of overwhelming odds induced liberty-loving people in many European countries to furnish the patriots with men and money. Prominent among those who figured in the struggle for Grecian freedom was Lord Byron, who died at Missolonghi in 1824. Russia, France and England finally interfered in behalf of the Greeks, destroyed the Mohammedan fleet at Navarino, and compelled Turkey to acknowledge the independence of Greece, 1829.

In 1853 the Emperor Nicholas of Russia demanded that a Russian protectorate be established over the Greek Christians in the Turkish Empire—a demand that was resisted by the Sultan. Nicholas thereupon declared war and invaded the Danubian Principalities. England and France joined Turkey as allies in 1854, and in 1855 Sardinia also embraced the cause of the Sultan.

The Russians were defeated and had to evacuate the Danubian Principalities. The seat of war was then transferred to the Crimea, a peninsula in the south of Russia, on the Black Sea. Here the Russians were defeated by the allies at the battles of Alma, Inkerman and Balaklava. Sebastopol, the greatest Russian stronghold on the Black Sea, was besieged, and after a protracted resistance capitulated. Peace was finally concluded at Paris in 1856.

War with Russia.

The European powers having been unable to satisfactorily settle the differences between Turkey and her other rebellious provinces, Russia interfered in behalf of the latter, and declared war against Turkey in 1877. A desperate struggle ensued, the most celebrated battle fought being that of Plevna, in which the Turks suffered a severe defeat. The result of the war was that the Danubian Principalities secured their independence, and Russia received Bessarabia, Batoum Kars and Ardahan in Asia.

Turkey in Europe at present covers about 62,028 square miles, and has a population of 4,786,545. Turkey in Asia occupies 710,320 square miles, and has a population of over 21,608,000.

In Egypt (the principal Turkish possession in Africa) the hold of the Sultan appears to be very weak. The present condition of Turkey seems to warrant the title, "the sick man of Europe," for some time applied to it.

Turkey has always been true to herself.

The history of the Mohammedan power is one of rapine, outrage and murder, and the massacres in Armenia were only what might have been expected. None the less they were enough to awaken the horror and indignation of all civilized peoples.

EGYPT

THE epoch of Menes is the first chronicle in the history of ancient Egypt, and has been placed at 5004 B. C. This fact points to a very ancient origin. Allusions are made to Egypt in the Book of Genesis and many other parts of the Bible. The history of the country is largely written upon tablets of stone, which in recent times have been deciphered, thus rendering Egypt a country of peculiar interest.

Unfortunately the decline which has affected all the old nations of the East has cast down the ancient glory and left everywhere the footprints of death. Still, in her ruins Egypt is a country of marvelous interest. Long subject to outside powers, she still maintains her traditional character and customs.

A royal dynasty ruled for some centuries before Cambyses, 524 B. C., and by that line of monarchs were constructed those grand pyramids, temples and obelisks, whose remains make of Egypt the oldest of classic lands. Cambyses brought Egypt under Persian sway till the time of the invasion of Alexander the Great, who built Alexandria.

After him came the line of Ptolemies, ending in the person of Cleopatra, under whom it became a Roman province. After a possession of 760 years the Romans gave place to the Saracens, who ruled Egypt till 1250, when the Mameluke dynasty was established.

At the beginning of the sixteenth century it fell into the hands of the Turks, under whom it became a satrapy, and the object of incessant contention among the Mameluke Beys. The French under Napoleon occupied the country, 1798-1802. In 1811, Mehemet Ali, after a massacre of the Mamelukes, made himself master of Egypt, and the succession was confirmed to him and his descendants by the treaty of London, 1841.

The Title of "King."

In 1866 enlarged powers were granted the Egyptian rulers by conferring on them the title of Khedive (king). The former Khedive Ismail Pasha, was deposed by the Sultan, June, 1879, and was succeeded by his son, Mohammed Tewfik.

The reigning Khedive is Abbas, born July 14, 1874, son of Mohammed Tewfik, who succeeded to the throne on the death of his father, January 7, 1892. In the summer of 1882, in consequence of a military rebellion, England intervened, subdued the uprising, and restored the authority of the Khedive. Egypt embraces 10,698 square miles and has a population of 6,817,265. The prevailing

religion is Mohammedan, exclusive of 600,000 Copts, who have the honor of being Christian descendants of the ancient Egyptians.

The country changes but slowly, is fixed and stereotyped, like all others of the Orient, and gives little sign of progress.

PALESTINE

PALESTINE derives its name from the Hebrew *Peleschеth* ("Land of the Philistines"), and in remote times was known as Canaan. Under the reigns of David and his son Solomon, it constituted a flourishing kingdom. The subsequent history of Palestine is identical with that of Judea and of the Jewish people, until its subjection by Rome.

The country remained in the power of the Romans till the conversion of the empire to Christianity, when it became an object of religious veneration. In the sixth century it fell under the sway of the Mohammedans, which gave occasion to the Crusades. Jerusalem was taken by the European forces, and was under Godfrey of Bouillon erected into a Latin kingdom, which endured for above eighty years, during which the Holy Land streamed with Christian and Saracen blood. In 1187 Judea was conquered by Saladin, on the decline of whose kingdom it passed through various hands, till, in 1517, it was finally added to the Turkish Empire.

To all Christians throughout the world Palestine is a Holy Land. It is associated with the lives of patriarchs, prophets and apostles, and also with that of Jesus of Nazareth. Early in the Christian era Jerusalem received the blow that shattered its sacred temple, and began the downfall of the most remarkable nation of the ancient world. The old landmarks are obliterated, the country has been desolated, no bright future seems to be before it, yet of all lands on the face of the earth it is the one whose soil is trod with reverent feet, and whose localities have an absorbing interest to the visitor.

Modern Changes.

As regards Jerusalem, a new town has sprung up outside the walls, and there are about 50,000 Jews in and about the holy city. Yet the character of the ancient nation has been changed and Palestine as it once was does not exist.

The present condition of the country shows the beginning of rapid changes in every direction. The thousands of visitors who every year pour into the country contribute in no small degree to alter the character, the habits and the ideas of the people. Roads are being everywhere constructed in a country where, but a few years ago, there were no roads. The traveler can now drive from Jaffa to Jerusalem, from Jerusalem to Jericho, and also from Jerusalem to Hebron. Societies formed for ex-

ploration have done much toward preserving the history of the country as revealed in its present ruins Those who wish to see Palestine as it has been for a thousand years and more, must go at once or they will never have the opportunity.

ARABIA

ARABIA consists of a peninsula, with a length of about 1500 miles, a breadth of 900 miles (Suez to Bassorah), and an area of more than 1,000,000 square miles. It sea-coast is over 1200 miles long, and a large proportion of the country is an arid, sandy desert. On the shores of the Red Sea and Persian Gulf there is, however, considerable good and fertile land.

The Arabs claim descent from Ishmael, and have always been a wild and independent people of nomadic instincts. Their history proper begins with the advent of the prophet Mohammed and the foundation of the Caliphate. There are properly from 12,000,000 to 15,000,000 inhabitants of the Peninsula, of whom all but a few Guebres (fire worshippers), some negroes and a few Jews, are Mohammedans.

Coffee, believed to be indigenous, is one of the chief articles of export, and balm, frankincense, gum arabic, cassia and other drugs and spices grow freely. Wheat, barley, beans, millet and lentils form the food of the natives, and almonds, dates, and tamarinds are largely exported. The rivers of Arabia are few and unimportant; the heat is intense, and little rain falls at any season.

CHINA

THE early history of China is lost in antiquity. In the 11th century the country was subjugated by Jenghis Khan, whose descendants were afterward supplanted by the *Ming* dynasty of native princes. In 1294 the first Christian missionaries reached Pekin. In the early part of the 17th century, the Ming dynasty was subverted by the Mantchoo Tartars, who substituted an emperor of their own race.

The first foreign powers to establish relations with China was Great Britain in the 17th century. In 1839, seizure by the government of opium belonging to British mer-

chants was the cause of hostilities, known as the "Opium War," 1840, and which was put a stop to by treaty in 1842, by which the Island of Hong-Kong was ceded to England, five ports opened free to foreign commerce, and a heavy indemnity paid the English merchants. This treaty was followed by one with the United States in 1844, and with France in 1845. In 1851, a rebellion on a large scale broke out, known as the Tae-ping Civil War, which, after many successes on the part of the rebels, was temporarily suppressed in 1853. Another war with England, in conjunction with France, occurred in 1856, in which Canton was bombarded, and Pekin menaced by the Europeans. Another treaty, June 26, 1858, terminated hostilities, and gave new and important advantages to foreigners, among which were the toleration of Christianity, the opening of new ports to commerce, and the reception at Pekin of foreign envoys.

In 1859, an attempt to ignore this treaty led to the occupation of Pekin by English and French troops; after which the treaty was ratified. From 1861 to 1868, the Tae-ping rebellion broke out anew, with slight intermissions. In 1867, Mr. Burlingame was appointed envoy-extraordinary from the United States to Pekin, and in 1868 effected a treaty with China, which conferred on Americans in China the same rights and privileges possessed by Chinese in the United States. The war between China and Japan in 1894 resulted disastrously to the former, the superiority of the Japanese arms being evident at every point of the contest. China sought by diplomacy to avert further catastrophe, and the strong hand of Russia was soon seen in the terms of peace.

In June, 1900, there was a violent outbreak in China against foreign residents, including representatives of the various governments and the outbreak was suppressed only by the armed intervention of the Allied Powers. Indemnities were demanded and guarantees that the foreigners in China should be protected.

JAPAN

THE empire is politically subdivided into provinces, departments and districts, formerly governed by upwards of 200 princes called *Daimios*, each of whom held absolute power over his own jurisdiction; in 1870–1, these princes were made subordinate to the *Mikado*, or supreme ruler of the Empire. This Mikado, or Emperor, is considered of semi-divine origin, and was until quite recently invisible to the people at large.

In 1542 the Portuguese established a settlement at Nagasaki, and the Dutch obtained a temporary footing in 1600, but intercourse with the outside world came to be entirely suspended until about the middle of the present century. Since 1867, several embassies have visited the United States and Europe. In February, 1889, a new consti-

tution was promulgated, establishing important reforms, such as a parliament, the right of suffrage to all men twenty-five years old and over, who pay a certain amount of tax, liberty of religion, of speech and the right to hold public meetings. Judges cannot be removed, except by special legislation.

Japan has shown a remarkable ability to adapt herself to Western civilization. With singular acuteness she has adopted ideas from other countries, and within the last few years has undergone rapid changes. These do not so much affect her form of government as her system of education, and, to some extent, her manners and customs. The Japanese have been called the "Yankees of the Orient."

When war broke out between her and China in 1894, she showed herself fully equipped for the conflict by possessing arms of the most recent type and by being thoroughly versed in the most approved methods of military tactics. Her swift and brilliant victory was anticipated from the first.

BRITISH INDIA

IN the widest sense of the term, British India comprises all that part of the great Indian peninsula which is directly or indirectly under British rule, as well as certain countries beyond that area which are under the control or protection of the Governor-General. The Government of the Indian Empire is entrusted to a Secretary of State for India, assisted by a Council of not less than ten members, vacancies in which are now filled up by the Secretary of State for India.

But the major part of the Council must be of persons who have served or resided ten years in India, and have not left India more than ten years previous to the date of their appointment; and no person not so qualified can be appointed unless nine of the continuing members be so qualified. The office is held for a term of ten years; but a member may be removed upon an address from both Houses of Parliament, and the Secretary of State for India may for special reasons reappoint a member of the Council for a further term of five years. No member can sit in Parliament. Therefore it will be seen that the intention is not to allow the representatives in the Council to have any controlling voice in the affairs of the country, yet they possess a certain influence.

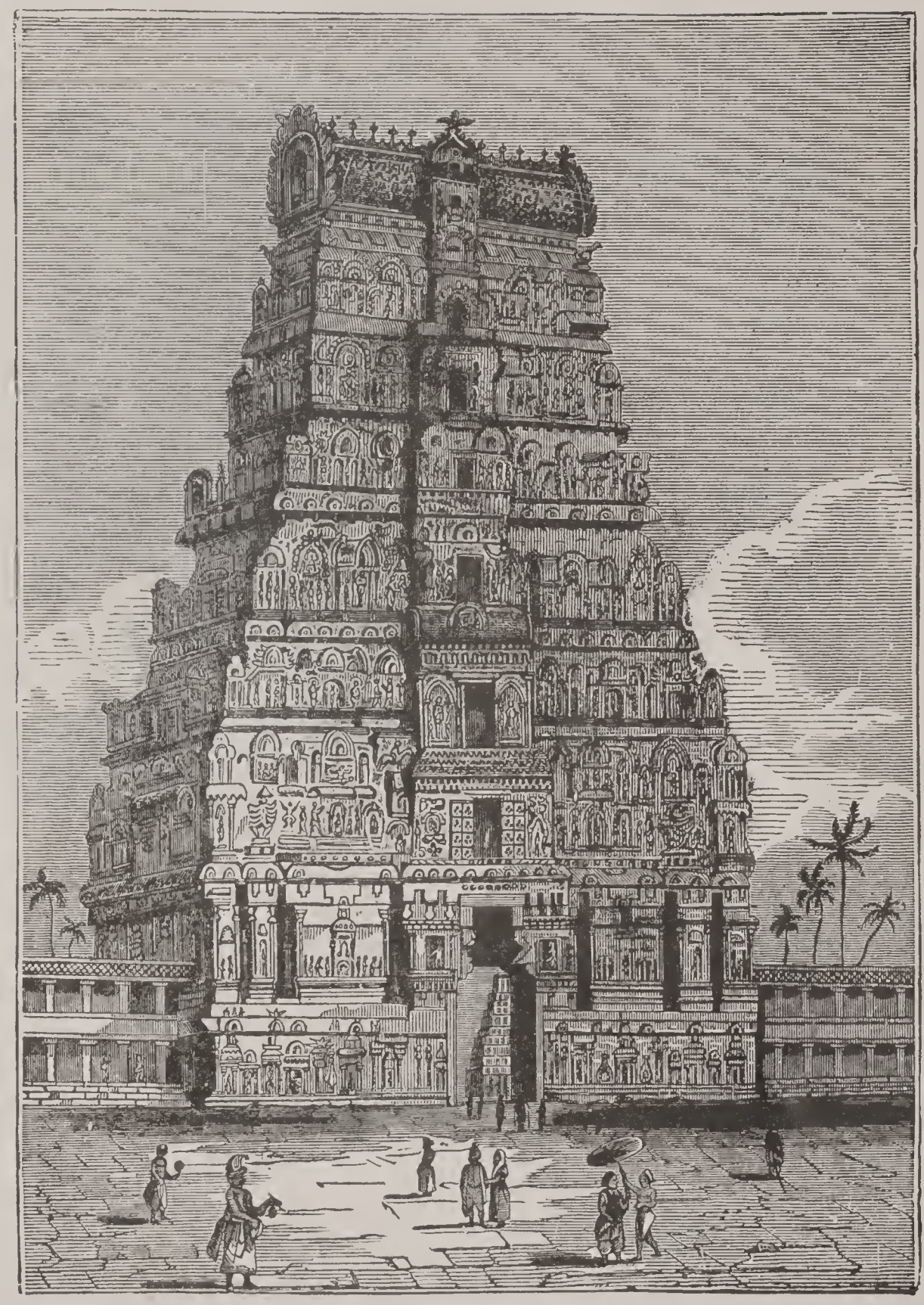
India is the ancient name of all that part of Southern Asia which extended from Persia to Serica (North China). The knowledge possessed of this portion of the world is extremely small, and dates from the expedition of Alexander the Great. Seleucus Nicator extended the conquests of the Greeks beyond the furthest point reached by

Alexander. Ptolemy learned more from subsequent travelers, and his grand division of the country into India Within and Beyond the Ganges has remained to the present day.

From the time of the expedition of Alexander the Great, in the 4th century, B. C., down to the 15th century of our era, the history of India, divided as it was into an infinity of independent states, is of comparatively little interest for the general reader. In 1525 the country was invaded by Babel, who established the Mogul line of princes, whose power culminated under his successor Aurungzebe.

British Arms.

After the latter's death, 1707, the Mogul dynasty began to decline; and after an unsuccessful attempt made by the French to establish their power in India, the foundations of a vast political power were laid between 1750 and 1765, by the greater resources and superior maritime strength of the English. Since that period the history of India presents but a succession of battles fought and territories conquered by British arms.



PAGODA OF CHILLENBAUM, INDIA.

In 1857 occurred the great Sepoy mutiny, which was extinguished after much bloodshed. In the year following, the foreign commerce of India, long a monopoly in the hands of the East India Company, was finally thrown open to the world, and their political jurisdiction vested in the British crown. The assassination of the Governor-General of India, the Earl of Mayo, in 1872, first attributed to political motives, seems to have been only an act of fanaticism. In 1878, over 500,000 deaths occurred at Madras alone by famine.

The costume is in numerous nationalities characterized universally by the ease, lightness and loseness common in the East and

suitable to the hot climate. But it varies in the many provinces, and, indeed, with every nationality. The turban (pagri) has every sort of dimension, from minute neatness to turgid massiveness.

The waistband (dhoti) extends often below the knee, in which case there is no trouser. Jackets in many styles are common. The woman's dress in many respects resembles that of the men. The petticoat is not universal. The headdress is often extended, so as to hang gracefully down the back. The shoe is not always worn; indeed, the humbler classes are generally barefooted. With them the blanket is often a plaid.

The black colors of Europe are seldom seen, but indigo blue is common. Otherwise white, set off by gay margins, and rich scarfs and shawls is the prevailing color. As a whole the national dress is picturesque, and a holiday crowd has the appearance of a flower garden.

Four-fifths of the population are affected largely by the caste system connected with the popular religion. A religious sanction in some degree attaches to infant marriage, or child marriage, with all classes; also, to the seclusion of women, and to the prohibition against remarriage of widows with the upper and middle classes.

In practice the women of the masses are not secluded, but, on the contrary, appear everywhere, and work out of doors; they remarry, too, if in widowhood. The burning of widows on the funeral pyres of their husbands has long been suppressed by the

ENGLISH TROOPS ON THE MARCH IN INDIA.

criminal law under British rule. Polyandry is found only among a few of the aboriginal tribes. Old customs, many of them barbarous and cruel, are disappearing before the advance of Christian civilization, but here, as elsewhere, the advance is very slow.

AFGHANISTAN and BELOOCHISTAN

AFGHANISTAN is subdivided into the three separate principalities of Cabul, Candahar and Herat. The Afghans belong to the Iranic race; they are of a vigorous spirit and proud temper. Afghanistan is continually being threatened by England and Russia, both of which nations desire the possession of Herat, which is the key of Central Asia.

The area is estimated at 225,00 square miles. Four-fifths of the country consists of rocks and mountains; the latter from the table-land in the north, varying from 15,000 to 16,000 feet in height and in the case of the Hindoo Coosh, to 20,493 feet.

Beloochistan is subdivided into six provinces. Nearly the whole country is mountainous, except in the northwest and along the coast, its general characteristics being a rugged and elevated surface, barrenness and deficiency of water. The famous Bolan mountain pass, which is the only means of communication with the interior of the country from the plains of Northwest India, is on the northeastern boundary. Kelate, the capital, is situate at 6000 feet above sea level. The products vary with the climate, which is cold in the elevated parts, and excessively hot in the lower valley.

The pursuits of the people are mostly pastoral. The inhabitants consist chiefly of Belooches and Brohooees, two tribes which are probably a race of mixed Tartar and Persian descent. Beloochistan was formerly subjected to Persia, and afterwards to Afghanistan, but its people conquered their independence in 1758. They are ruled by several chiefs, under the more or less nominal authority of the Khan of Kelat

Products of the Country.

Among the natural productions of Afghanistan is the plant yielding asafœtida. The castor-oil plant is everywhere common, and good tobacco is grown in the district of Kandahar. Aitchison says that the cultivated area around Herat produces magnificent crops of wheat, barley, cotton, grapes, melons and the mulberry tree; the production being only limited by the amount of labor procurable.

Surrounding the villages and in orchards the ash, elm, apricot, apple, plum, quince, peach and pomegranite are cultivated. In special localities are forests of pistachio, its leaves being used in dyeing.

The general appearance of the country during winter is barren and arid in the extreme, owing to the absence of trees and woody shrubs; but in spring a mass of vegetation springs up, giving a grand coloring to the landscape. The industrial products are silk, chiefly for domestic use, and carpets.

The manufacture of *postins*, or sheepskins, is one of the most important of the industrial occupations of the people, and of late years the trade in this article has greatly increased. Afghanistan is crossed by several trade-routes leading to India on the one side, and to Persia and Turkestan on the other; merchandise is carried by camels.

SIAM

LITTLE of a reliable character is known of the early history of Siam. The foundation of Ayuthia, its former capital, dates from 1350, and in the sixteenth century its territorial rule extended from the Cambodia River as far south as the Strait of Malacca. In 1782 the existing dynasty mounted the throne, and in 1855–6, treaties were effected with the United States, England and France, which have largely facilitated foreign trade, opened out the resources of the country, and generally been the means of introducing many of the arts and manners of the Western nations among the Siamese people. The population is estimated at 6,300,000.

The monarchy is absolute and hereditary, and there are two kings, of whom the first is the actual reigning sovereign, the second receiving one-third of the revenue, and exercising the administrative functions of chief minister. Buddhism is the dominant form of religion, and the pagodas of Siam are the finest of all Indian temples. Within the last few years the king has raised a small regular army officered by Europeans; and in time of war the entire adult population are liable to be called out any time for military service.

The men are of an olive color, with little beard; but the women are of a straw complexion. They have been said to excel in the fabrication of gold, in fireworks and in miniature-painting; but in mechanical ingenuity they are decidedly inferior to the natives of China and Cochin-China.

Characteristics of the People.

The chief production of Siam is rice. It is the national food and its export forms a great source of wealth to the country.

The Siamese are very social, vain and fond of bright dresses and jewelry. Their intercourse with each other is conducted with ceremonious attention to distinctions of rank. They shave the heads of their children, with the exception of a tuft on the crown, which is cut off with great ceremony at the age puberty.

Marriages are negotiated by elderly women who find out if the birthdays of the intended bride and bridegroom are suitable, for the Siamese are superstitious in this respect. The marriage ceremonies, during which the chewing of betel-nut plays an important part, last two or three days and

all friends are entertained liberally during this time. The houses are built of wood or bamboo. thatched with palm. Furniture there is none, unless a mosquito net, a mat or two and cooking utensils be reckoned furniture, and these are very crude.

PERSIA

PERSIA dates its rise as a nation from after the fall of the Assyrian and Babylonian Empires, and under Cyrus extended from the Indus almost to Greece and Libya. Conquered by Alexander the Great, it became during several centuries afterward a Greek satrapy; and about 200 B. C. a Parthian monarchy. In the third century A. D. the native rule was restored under the Sassanides dynasty.

Later, Persia became the prey of the Tartars, the Turks, the Afghans, until redeemed by the victories of Nadir Shah. After the death of the latter the country again became the scene of social anarchy and civil war, which continued till the establishment of the present dynasty. In 1871–2 the more Southern and Eastern provinces were desolated by a terrible drought and famine, which swept away thousands of the inhabitants. In 1873 the Shah visited Europe. Estimated population, 10,000,000.

Some of the immense valleys of Persia abound with the rarest and most beautiful vegetable productions; among them are wheat of the very best quality, barley and other cereals, cotton, sugar, rice and tobacco. The vine flourishes in many of the provinces, and the wines of Shiraz are celebrated. The mulberry-tree is largely cultivated, silk being one of the most important staples of the country. The chief manufacture is that of silk stuffs, of the richest kinds; other fabrications include textile goods, arms, carpets, shawls, etc. Persian commerce is very extensive, and chiefly carried on with Russia by way of the Caspian Sea, and with British India by way of the Persian Gulf.

A Despotism.

The government is a despotism under the *Shah*, or sovereign; and though a large amount of the taxes levied never reaches the royal treasury, yet the latter is reported to possess immense wealth in bullion and precious stones. Mohammedanism of the Shiah type is the prevailing form of religion. The Persian (or Persic) is the most celebrated of all the Oriental languages in respect of strength, copiousness and poetic harmony. and is written from right to left.

The houses in Persia, those of the wealthiest people, not excepted, appear contemptible, being generally built of earth or mud and are grouped, even in the towns, with

little attention to uniformity or order. The interiors, however, of the houses of the rich are sometimes perfect paradises of luxury and elegance. The miserable look of the towns is, moreover, greatly redeemed by the beauty of the gardens which surround them.

THE BARBARY STATES

BARBARY and Egypt formed nearly all of Africa known to the ancients. It was peopled chiefly by Moors, Numidians and Phœnician colonists; it attained great celebrity during the Carthaginian dominion; was afterwards subject to the Romans, and occupied for nearly a century by the Vandals. The Arabs took it finally from the Romans, about B. C. 697.

Barbary is an extensive region, comprising all the northern portion of Africa, from Egypt to the Atlantic Ocean, and from the Mediterranean to the Greater Atlas. It is divided by the Atlas range into two regions, that on the north comprising the four Barbary States, viz., Morocco, Algiers, Tunis and Tripoli; and the southern region, called Beled-ul-Jerid, or Country of Dates.

In this region stood the celebrated city of Carthage in ancient times. Its site was about ten miles northeast of the present city of Tunis. It was founded by Phœnicians, eight hundred and sixty-nine years before the Christian era. The Phœnicians were the first people who engaged in commerce, and founded colonies for the purpose of carrying on trade.

The city of Algiers was built by the Saracens, in the year 944. The Government, called the Regency of Algiers, was founded in 1518, by two Turks, named Horuc and Hagradin. They were brothers, and both bore the name of Barbarossa, or Red-Beard.

American Resistance.

The country now called Morocco was conquered by the Saracens about the same time with the other Barbary States. So also was Tripoli. All these states, except Morocco, afterward fell into the hands of the Turks. During a long period, the Barbary States were in the habit of fitting out vessels to cruise against the ships of other nations. Their prisoners were sold as slaves, and never returned to their own country, unless a high ransom was paid for them.

The Americans were the first who made any considerable resistance to these outrages. In the year 1803, Commodore Preble sailed to the Mediterranean Sea with a small American fleet. He intended to attack Tripoli; but one of his frigates, the Philadelphia, got aground in the harbor. The Turks took possession of the Philadelphia. But one night Lieutenant Decatur entered the har-

bor of Tripoli, and rowed toward the captured vessel, with only twenty men. He leaped on board, followed by his crew, and killed all the Turks, or drove them overboard: the Philadelphia was then set on fire.

After this exploit, Commodore Preble obtained some gunboats from the King of Naples, and with these and the American vessels, he made an attack on the fortifications of Tripoli. The Bashaw of Tripoli was forced to give up his prisoners. In the year 1815, Commodore Decatur—the same who had burnt the Philadelphia—was sent with a fleet against Algiers. He captured their largest vessels, and compelled the Algerines, and the Tripolitans also, to agree never more to make slaves of Americans.

In 1816, Algiers was battered by an English fleet under the command of Lord Exmouth. This was the severest chastisement that the Algerines had ever received at that period. But in 1830, the French sent a large naval and military force against Algiers, commanded by Marshal Beaumont.

The war continued for seventeen years, an Arab leader, by the name of Abd-el-Kader, making a powerful resistance to the French. At length Abd-el-Kader was defeated and taken prisoner; so the country was conquered, and Algiers, under the name of *Algeria*, is now a province of France.

ABYSSINIA

ABYSSINIA was a part of ancient Ethiopia; its inhabitants are of a dark olive complexion. In 1867, the British Government, having wrongs to avenge, sent to Abyssinia an army of 10,000 men; and the expedition resulted in the death of the Emperor Theodorus II., and the destruction of his capital, Magdala.

A few years ago Italy endeavored to plant a colony in Abyssinia. The new colony is nearly self-supporting, but in their endeavor to extend their influence, the Italians came to blows with the Abyssinians whom they had taken under their protection. Abyssinia, the only state of Central Africa with a pretence to civilization, is made up of the territory of a few hundred fierce clans whose chieftains render more or less obedience to the "Negus" or King. The people of that country are nominally Christians, but their rites are strangely mixed with Pagan usages as old as their hills. The main difficulty between Italy and Abyssinia seems to arise out of the determination of the former to put down slavery.

Early in March, 1896, a bloody battle was fought between the Abyssinian troops and the Italian army, in which the latter was utterly defeated with great loss of life, and a check was put upon the ambition of Italy to make for herself a position like other European nations on African soil. The defeat created great excitement in Rome and other parts of Italy, and led to the instant downfall of the Crispi Ministry.

Abyssinia consists of two districts, Tigre and Amhara and Shoa. The country is mountainous, but in the vales the soil is fertile. The rainy season continues from June to September, succeeded without interval by a cloudless sky and a vertical sun,

but cold nights follow those scorching days. Though situate between the tropics, the productions of Abyssinia rather resemble those of the temperate than of the torrid zone. The population is estimated at 3,000,000.

REPUBLICS IN SOUTH AFRICA

ONE of the earliest settlements in South Africa was that of the Dutch at the Cape of Good Hope. In 1806 Great Britain acquired their domain, following which the Dutch emigrated in large numbers, moving north and east. They acquired by force of arms from the Zulas the country known as Natal, where they settled. The number of the Boers, as they were called, who left the British colonies was about 10,000. They organized a government, and in 1854 the British guaranteed them complete independence.

The Boers also established a republic known as the Transvaal, the independence of which was acknowledged in 1852. Here they have remained until the present time. They have had the name of being very exclusive and refusing rights to foreigners who wished to enter their country. In 1877 the republic was on the eve of dissolution, owing to an exhausted public treasury. The British government consented to assume care of it, but a rupture came, resulting in war and the conventions of 1880 and 1884 and conceding certain rights to the British.

Early in 1896 a British company, with possessions bordering on the Transvaal, attempted to conquer the Boers. In this attempt they were led by Dr. Jameson, but his force was signally defeated. This disaster caused excitement throughout England, especially as Germany expressed its sympathy with the Boers.

In 1898 war broke out between the British and the Boers, which, as it progressed, was favorable to the former.

The state has immense latent wealth in its minerals, for, in addition to the numerous gold-fields the deposits of silver, copper and lead, iron, coal, cobalt, and other metals and minerals, are sufficient to show that nature has favored the Transvaal beyond all African States. The country is rich in corn and pasture land. The climate is, as a rule, healthy, and in some parts exceptionally bracing. The number of English-speaking residences is fast increasing on account of emigration.

Republic of Liberia.

Liberia is a small Republican State of West Africa and occupies a part of the coast of North Guinea. Length, 600 miles; breadth interiorward, 50 miles. Monrovia is its capital, at the mouth of St. Paul's River. The principal exports are coffee, sugar, palm-oil, camphor, indigo, ivory and gold dust. The population consists of 20,000 "Americo-Liberians" (immigrants from America and their descendants) and 600,000 aborigines. The first settlement was formed by free negro colonists from the United States, at Cape Mesurado, in 1820. The colony became an independent republic

in 1847. The constitution and government are based upon the model of those of the United States.

The Congo Free State has sprung out of the discoveries of Stanley and the explorations of the International Association, founded at Brussels for the opening up to civilization of the Congo and its tributaries. Its autonomy was recognized during 1884 and 1885 by the leading powers of Europe, and by the United States, conditioned upon its maintaining the principles of free trade. There are twelve territorial divisions, the capital being Boma.

The central government is at Brussels, and consists of the King of the Belgians as sovereign, and three departmental chiefs. On the Congo there is an Administrator-General and several European administrators of stations and districts. The rest of West Africa is variously "protected" by England, France, Germany and Portugal.

CAPE COLONY

CAPE COLONY is an extensive territory belonging to Great Britain, comprising the greater portion of the South African continent. It has an area of 183,286 square miles, with a coastline of 1,150 miles. The entire country consists of three elevated plateaux intersected by three great mountain-chains, between two of which is what is called the Great Karroo, a desert plain nearly 500 miles long by 100 broad. The principal rivers are the Orange, Great Fish River, Elephant, and their affluents. Saldanha Bay is by far the best harbor on the coast. Minerals are known variously to exist, but have been hitherto little mined. Some gold has been found, together with diamonds and and other precious stones. The products are fruits, tobacco, wool, etc. Sheep-farming is the staple industry of the country. The chief towns are Cape Town (the capital), Grahamstown, Zwellendam.

The aborigines consist of Hottentots and Caffres; the colonists are chiefly English, Dutch and French. Cape Colony is governed by an English viceroy, and is an important British military and naval station, being considered the key to the Indian Ocean. In 1650, the cape was colonized by the Dutch, from whom it was taken by the English in 1795, and finally ceded to them in 1815. Population, 566,158.

Ostrich-Farming.

Ostrich feathers have long been an article of export from the Cape. For many years they were obtained at the expense of the death of the birds, but in 1864, ostrich-farming was commenced at the Cape and is now one of the leading industries. The feathers of the wild bird are more beautiful than those of the tame bird, and are recognized at once by those engaged in the feather trade. A few elephants and buffaloes are still preserved.

MADAGASCAR

MADAGASCAR is the largest of the African islands, situated to the east of the continent, from which it is separated by the Mozambique Channel, and surrounded by the waters of the Indian Ocean. It contains a population of about 4,000,000. It is 1010 miles in length, and 370 at its greatest breadth, containing an area estimated at 228,540 square miles.

The island was known to the early Arabs as Jezira-el-Komr, and became known under its present name through Marco Polo. Its actual discovery is due to the Portuguese, 1506. By a treaty signed at Tamatave, December 12, 1885, Madagascar was declared a French protectorate, and a port on Diego Suarez Bay was ceded to France, now converted into a naval station. The British acknowledged the French protectorate of Madgascar in 1890.

The soil is fertile, with rich pasturage, and magnificent forests abounding in valuable trees and medicinal plants; the other products are rice, sugar, silk, cotton, cocoanuts, bananas, sweet potatoes, indigo, pepper, India rubber, etc. Iron ore is found in several places, and coal is also said to exist; gold, silver, copper and lead are also found in small quantities. The principal manufactures are jewelry, chains, necklaces, straw hats and dresses, termed lambas.

AUSTRALIA AND NEW ZEALAND.

AUSTRALIA is an immense island-continent, containing 3,000,000 square miles and has about as much territory as the United States. Its nearest distance to England is about 11,000 miles. The mountains of any great height are all on the east side, and there is but one great river, the Murray. Gold is distributed more or less through all the Australian Colonies, but chiefly in Victoria, Queensland and New South Wales. Diamonds and other precious stones have also been found in different parts of the continent. The country is rich in Coal fields, mineral Oils and Copper mines. Silver, Iron and other metals form mines of inexhaustible wealth. Mining is a great and growing industry, employing many thousands of laborers. The highlands are rich in wood; 40 miles east of Melbourne are many trees over 400 feet high. The Vegetation of Australia is unique, being rich in species and in many parts very luxuriant. The climate is somewhat uncertain, and the country has large

barren tracts that are unproductive, but in large upland tracts agriculture, including the raising of sheep, is a profitable industry. Since the discovery of gold in 1851 the population has rapidly increased. The largest cities are Melbourne, capital of Victoria; Sydney, of New South Wales; Adelaide, of South Australia; Ballarat, of Victoria; and Brisbane, of Queensland. Each of the great divisions of Australia forms a separate colony, exercising its own administration, passing its own laws and levying its own fiscal duties. There is no State Church in Australia, each of the religious sects being self-supporting. In all the Colonies education is either free or compulsory.

New Zealand comprises three main islands—the North, South or Middle and Stewart—besides a number of islets near the coast. The main islands have a length of 1100 miles. The total area of the colony is 106,240 square miles, or about one-eighth less than that of Great Britain and Ireland. New Zealand is composed of rocks of all geological ages, including large deposits of volcanic rocks. Two of the islands are traversed by great mountain chains. The climate of New Zealand is one of the best and healthiest. The lowlands are good for tillage; some parts require to be irrigated. Grains yield good returns, and sheep raising is a profitable investment. The chief mineral product is gold. The inhabitants are intelligent and industrious.

OCEANICA

OCEANICA comprises what may be called the fifth division of the globe, including the great island of Australia and a majority of the smaller islands lying between the Indian Ocean and the China Sea on one side and the Western world on the other. A sketch of Australia has already been given; others may be noticed as follows:

New Guinea was discovered by the Portuguese in 1511. It is now divided between Holland, England and Germany; the German portion is called Kaiser Wilhelm's Land.

Borneo, which, until the naturalist Wallace's explorations proved that New Guinea had the greater area, was believed to be the largest island in the world except Australia, was discovered in 1578 by the Portuguese. In 1690 they effected a settlement, but were soon driven out from it. In 1702 and 1774 England made unsuccessful attempts to

colonize the island, but of late years she has managed to acquire a controlling influence over the northwestern coast of the island.

Sumatra, Java, Celebes are among the larger single islands, while among the most important groups are the Malay Archipelago, in which these are included, and almost all of which have been subjugated by the Dutch, the Spaniards, the Portuguese and the British; the New Hebrides and Polynesia, which general terms include, among others, the Hawaiian, which is one of the most important in the Pacific Ocean. In 1829 the independence of these islands was acknowledged by the United States, who were followed in 1843 by the British and in 1844 by the French. Queen Liliuokalani, who succeeded Kalakaua, was deposed in 1894 and a republican form of government was adopted.

New Caledonia, an island lying to the east of Queensland, was taken possession of in 1853 by the French, who established there a naval station and a penal colony, which are still maintained.

New Zealand was first visited by the Dutch navigator Tasman in 1642. A colony was first established in 1840. Gold fields were discovered in 1857 which brought a large immigration. Executive authority is vested in a Governor appointed by the Crown; there is also a General Assembly consisting of a Legislative Council and a House of Representatives.

Tasmania, formerly known as Van Dieman's Land, ceased being a penal colony in 1853, since which time its population and prosperity have largely increased. A Governor appointed by the Crown holds the executive; there are also a Legislative Council and a House of Assembly.

VENEZUELA

COLUMBUS on his first voyage discovered the Paria coast on the 31st of July, 1498. The next year the whole Venezulean coast was skirted by Ojeda and Amerigo Vespucci, and the name "Little Venice" was given to an Indian village built on piles (as is common) on the shores of Lake Maracaybo; this is the origin of "Venezuela," the name now of the whole country.

In 1527 the territory of Coro was pledged by Charles V. to the Welsers of Augsburg, whose governors and adventurers had eyes and thoughts only for gold and the fabled **El Dorado.** In 1558 the Crown resumed possession; Caracas was founded in 1567, and in 1578 became the seat of government.

During the 17th century the attentions of the Crown were limited to extracting as much revenue from the colony as possible, while the people entered earnestly on agriculture and stock raising, and the various religious orders arrived and partitioned out the territory among themselves.

But the next century saw the beginning of troubles. The government insisted on all trade being carried on with Spain alone, and ultimately with only one city—first Seville, then till 1778, Cadiz. Legitimate commerce dwindled away, and smuggling by the

Dutch and English alone interfered to keep down the enormous prices of European goods. The first revolt occurred in 1749; other outbreaks kept the land in a ferment, until in 1810 the revolution began which ended in the independence of the country and the withdrawal of the royal forces in 1821.

From 1870 to 1877 the "Illustrious American," General Guzman Blanco, was first dictator and then president, and did much to rescue the country from its embarrassments. Joaquin Crespo is the present ruler.

There has never been any agreement between Great Britain and Venezuela as to the boundary line between the latter country and British Guiana. The Venezuelan Government represented to ours at Washington that Great Britain was disposed to make encroachments and claim territory that did not by right belong to her.

In December, 1895, President Cleveland sent a strong message to Congress on this subject, in which he took occasion to assert in very plain terms the Monroe Doctrine. A United States Commission of inquiry on the boundary question was appointed. Great Britain furnished the Commission with all information that could be of service in reaching a just and equitable conclusion. The result was an Anglo-American Venezuelan boundary treaty which was ratified at Washington, June 14th. Venezuela granted territory, with privileges, to Great Britain, February 9th, 1898.

BRAZIL

ALONG the sea coast and banks of some of the rivers, besides some extensive tracts in Minas-Geraes, the country has been brought under cultivation; but by far the greater portion of the surface remains in a state of nature. The dense forests furnish almost every variety of useful and ornamental timber, more than one hundred species of palms, logwood, mahogany, Brazil, and numerous other dye-woods, with sassafras, sarsaparilla, ipecacuanha, and a great variety of other drugs. Cocoa is an indigenous product; maize, sugar, coffee, cotton, rice, wheat and tobacco, have been introduced by European culture.

The animal as well as the vegetable products here present the greatest diversity. The diamond mines of Minas-Geraes are at present the most productive known. Other gems, and large quantities of gold, besides silver, copper, iron and platinum, are among the mineral riches of the same province. Manufactures in Brazil are confined to cotton-weaving, tanning, and the production of goods of primary necessity.

Brazil was discovered on the 26th of January, 1500, by the Spaniards under Pinzon, one of the companions of Columbus. In the same year the Portuguese fitted out an expedition to follow up the successful discoveries of Vasco de Gama in the East, and finally took possession of the country in 1640.

In 1808 the royal family of Portugal was expelled by the French and took refuge in Brazil, and the first act of Dom Joao VI.,

was to open Brazilian ports to foreign commerce. Other wise and liberal measures greatly stimulated the growth of the country. In 1822 he was succeeded by his son who was proclaimed and crowned Emperor as Dom Pedro I. His reign, however, was not a fortunate one. Vexed with the opposition he encountered he abdicated in 1831 in favor of his eldest son Dom Pedro II.

After a brief government by regencies, Dom Pedro II. was crowned in 1840. He proved to be a wise and liberal ruler and was popular with his people until the revolutionary disturbances of 1895, when he fled to Europe where he soon afterward died. The population of Brazil is 14,000,000, and a good deal of enterprise is shown in developing the resources of the country.

PERU

PERU is, for the most part, of igneous formation and contains a number of active volcanoes, that of Omati being the principal. Earthquakes are frequent and violent. Lying off the coast near Callao are the Chincha Islands, which, with those of Guadafe and Macabo, yield guano in vast quantities. Agriculture is much neglected, although the land is productive of excellent coffee, cocoa, cotton; besides drugs, tobacco, pimento, dyestuffs, etc. The chief articles of export are, after guano, gold, silver, wine, sugar, quinine, wool, etc.

When Pizarro, at the head of a small band of Spanish adventurers, first landed on the shores of Peru, 1532, he found it governed by sovereigns called Incas, who were looked up to by their subjects with awe and veneration; and the inhabitants were distinguished for their mild and polished manners. But the avarice of their European conquerors led to scenes of blood and desolation; the last Inca, Atahualpa, was put to death, and the Peruvians became the victims of the most unheard-of cruelties.

After being for nearly three centuries a Spanish viceroyalty, Peru, in 1821, along with the rest of Hispaño-America, achieved its independence. In 1864, the Spaniards seized the Chincha Islands until Peru should make reparation for injuries inflicted upon Spanish subjects, and held them till 1866, when Peru agreed to pay an indemnity of 60,000,000 reals. This treaty was not ratified, and an alliance entered into with Chile. After war for nearly three years, peace was restored in 1869 by the intervention of the United States. In 1881, war broke out between Peru and Chili, resulting in the defeat of Peru, and the occupation of portions of the country by the Chilean army.

As a Republic.

On June 3, 1886, General Caceres, who had gallantly defended his country against the Chilians from first to last, became constitutional president of Peru. His policy was retrenchment and the protection of the Indian population. Payment of interest of the foreign debt had become impossible. General Caceres served his term of office, and was peacefully succeeded as president, on August 10, 1890, by Colonel Don Remijio Morales Bermudez. Peru is thus slowly

recovering from the disastrous effects of a great calamity.

The natural resources of the country are being developed, a greater interest is taken in public affairs, and with a more stable government, supported by the popular will, there is reason to predict a bright future for Peru.

CHILI

THE backbone of this country is found in the Great Cordillerras of the Andes, here attaining an average height of 14,000 feet, many of whose peaks are volcanic, notably that of Aconcagua (the highest Andean summit), which has an altitude of 23,910 feet above the sea. The coast-line presents steep and rocky shores, broken into by some excellent harbors. The rivers and lagoons are so small as to be undeserving of mention. Climate healthy, taken, as a whole; a scarcity of rain is, however, often felt. Earthquakes are of common occurrence; the last great shock doing much damage in 1868.

Chili is one bed of metals: silver, gold, lead, and iron are found largely and worked; copper, however, is the principal resource of the national wealth, and is mined by Englishmen on an immense scale. Sulphur, antimony, zinc, manganese, alum, nitre, salt, coal, are other mineral items which influence a large exportation. The soil is of varying fertility, fattening most towards the South and the foothills of the Andes.

Many hard woods are made useful, instead of iron, and the fruits of the temperate zone thrive excellently. The Chileños have thriven greatly since their emancipation from Spanish rule: the bulk of commercial transactions is carried on with Great Britain.

Valparaiso is the chief port, Santiago is the capital; Valdivia, Concepcion, Talca are among the largest and finest towns. The government is formed on the constitution of 1833, and consists of three departments—the executive, legislative and judicial. The first is in the hands of a president, whose tenure of office is five years; the legislature consists of a Senate and Chamber of Deputies. The state religion is the Roman Catholic; other religions are tolerated, but their public exercise is not allowed. Chili, before the Spanish irruption, belonged to the Incas of Peru; in 1535–1540, its whole extent, excepting only Araucania, was conquered by the lieutenants of Pizarro. It thenceforward become a Spanish colony, until 1817, when, after a seven years' war with Spain, the victory of Maypú, gained by General San Martin, secured the independence of the country. At present Chili is the most flourishing of all the Hispaño-American republics.

Climate and Scenery.

The temperature of Chili is remarkably even and pleasant and always cool at nights. In the south it is dry for about eight months in the year and rainy the other four. Vines grow well on the hillsides and are a source of large income. The Andes are almost everywhere visible, covered with perpetual snow. There are many volcanic peaks, mostly extinct. Chili is subject to frequent shocks of earthquake and occasionally to

destructive tornadoes. The railway system of Chili is well developed, and in the northern provinces there are several mineral railways belonging to English companies. The Constitution of Chili is Republican and based upon that of the United States.

UNITED STATES OF COLOMBIA

FORMERLY known as New Granada, the United States of Colombia is one of the most progressive of the South American Republics. It lies in the extreme northwest angle of the continent. On the north is the Caribbean Sea; on the northeast and east, Venezuela; on the southeast and south, Brazil and Ecuador; and on the west, the Pacific and Costa Rica. Its extreme length from north to south is 1000 miles, and the extreme breadth from east to west, 760; on the Isthmus of Panama, however, the breadth is but 28 miles. It has an area estimated at from 480,000 to 520,000 square miles. The population by the last census was 2,880,633. Of these, rather less than a million are whites, and about an equal number have a large admixture of Indian blood. The remainder are civilized Indians, mulattoes, savage Indians, and the various crosses between whites, Indians and negroes.

The form of government established by the constitution of 1863 resembles in many respects that of the United States. The president is elected for two years. The Senate consists of three members from each of the states, and the lower house of delegates from the several states, each sending a member for every 50,000 inhabitants. Each state has its own legislative and executive officer.

CENTRAL AMERICA

UNDER the head of Central America the countries embraced are the Republics of Guatemala, San Salvador, Honduras, Nicaragua and Costa Rica. They declared their independence September 21, 1821, and separated from the Mexican confederation July 21, 1823. The states made a treaty of union between themselves March 21, 1847. There has been among them since much anarchy and bloodshed, aggravated greatly by the irruption of American filibusters under Kenny and Walker, 1854–5.

In January, 1863, a war began between Guatemala (afterward joined by Nicaragua) and San Salvador (afterward supported by

(Honduras). The latter were defeated at Santa Rosa, June 16th, and San Salvador was taken, October 26th; the President of San Salvador, Barrios, fled, and Carrera, the dictator of Guatemala, became predominant over the confederacy. General Barrios, President of Guatemala, attempts the union of the five states, himself to be dictator, opposed by all except Honduras, February. He is defeated and killed in a prolonged battle at Chalchuapa, April 2d; peace with the states signed April 16, 1885.

CUBA

"GEM of the Antilles," as Cuba has long been called, it is at once the largest, most picturesque and inviting of all the West India Islands. Here are scenes of tropical loveliness, plantations with fertile soil and thrifty products, flourishing towns and beautiful harbors, a mixed population comprising all social grades and all degrees of intelligence.

The insurrection going on in Cuba in 1895 and 1896, aroused the sympathies of the American people. Spain sent a large army to beat back the rising tide of patriotic impulse and hold the island still under her domineering rule. Secret expeditions were fitted out from the United States, and the sympathy for the Cuban cause expressed in Congress stirred the hot blood of the proud Castilian and mobs in different parts of Spain assaulted and dishonored the American flag.

Cuba was discovered by Columbus in 1492. The Spanish settlement was consummated in 1512, and the culture of sugar-cane and tobacco introduced about 1580. American filibustering expeditions against the island occurred in 1850–51, both of which ended disastrously to their projectors. Owing to the oppressive rule sanctioned by the home government, the island broke out into revolt in September, 1868, and her people, declaring their independence, formed a so-called National Junta, and appointed Don Manuel Cespedes their commander-in-chief.

Years of Warfare.

A sort of guerrilla warfare was thus initiated, and carried on until 1878, marked by random engagements and resultant massacres on both sides. Since October, 1868, about 90,000 soldiers have been sent to Cuba from Spain, of whom scarcely 15,000 survived. In addition to these, nearly 100,000 were sent in 1895–96.

The soil is fertile in the extreme; forests of vast extent are interspersed over the interior, presenting a vegetation almost unequalled for luxuriance and variety. The climate is hot and variable; hurricanes and shocks of earthquake are frequent. Sugar is the chief staple followed by tobacco, coffee, rice, maize, tropical fruits and vegetables.

The struggle of Cuba for independence culminated in war between the United States and Spain in 1898. The destruction of the United States battleship Maine in the harbor of Havana aided in precipitating the conflict. The Spanish fleet at Manila was destroyed by Admiral Dewey and later the city was captured. The destruction of the Spanish fleet at Santiago by the North Atlantic squadron and the victory of the American forces on land was followed by a treaty of peace. Cuba became free, under a protectorate by the United States. A republican form of government was adopted and on December 31st, 1901, Senor Thomas Estrada Palma, candidate of the National party, was elected president.

HAWAII

OR

THE SANDWICH ISLANDS

UNUSUAL interest was awakened throughout America by the agitation in Hawaii, or the Sandwich Islands, which resulted in the overthrow of the monarchical government and the establishment of a Republic.

In 1843 the independence of the government was formally guaranteed by the English and French. A line of monarchs followed, the last male member of which was King Kalakaua, who died at the Palace Hotel, in San Francisco, January 20, 1891.

It was his travels and extravagance that caused the financial troubles which led to a change in the form of government. Princess Liliuokalani, who succeeded her brother, proved herself to be an erratic and self-willed ruler. She was constantly at variance with her legislature and advisers, and in January, 1895, attempted to promulgate a new constitution, depriving foreigners of the right of franchise and doing away with the existing House of Nobles, at the same time giving herself power of appointing a new house. This was resisted by the foreign element of the community, who at once appointed a committee of safety consisting of thirteen members, who called a mass meeting of their class, at which twelve or fifteen hundred persons were present.

The Queen Condemned.

That meeting unanimously adopted resolutions condemning the action of the Queen and authorizing a committee to take into further consideration whatever was necessary to protect the public safety. The committee issued a proclamation to the Hawaiian people, formed itself into a provisional government, took possession of the national property and sent commissioners to the United States, inviting this republic to annex the islands A treaty to that end was proposed by President Harrison in February, 1893.

When Mr. Cleveland entered upon his second administration he set this treaty

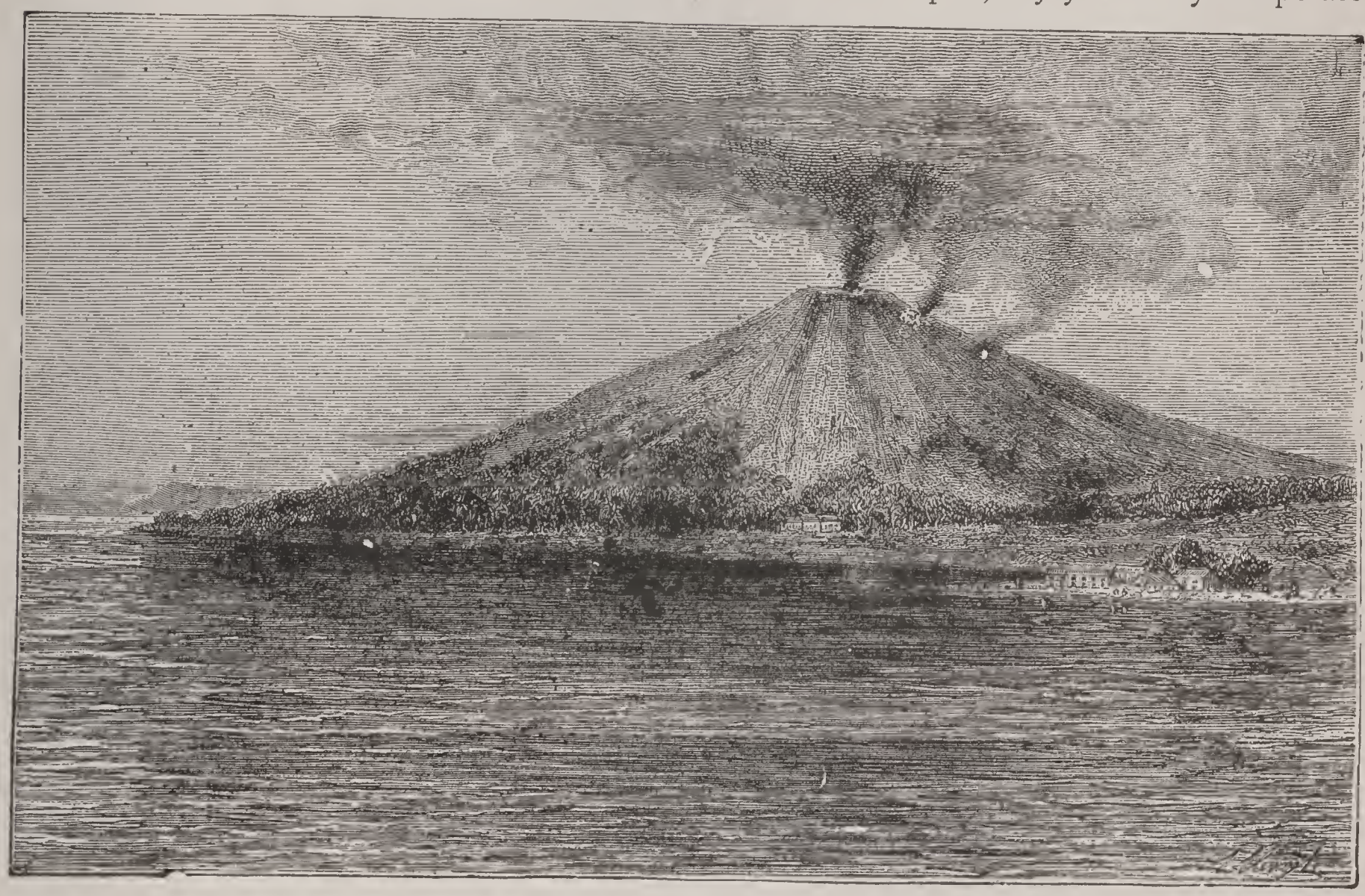
aside and was openly accused of expressing sympathy with the party who favored the retention of the Queen upon the throne. The new form of government, however, has existed, and the islands are now under its control.

The Sandwich Islands are thirteen in number, the eight principal of which are inhabited, viz., Hawaii, Oahu, Maui, Molokai, Lanai, Nihau, Kahoolani and Atuai. Hawaii, the largest of the group, contains the capital. Honolulu has an area of about 4000 square miles, and embraces within its limits two of the largest volcanic mountains in the world—Mouna Loa and Mouna Koa—each with an elevation of about 14,000 feet above the sea. These islands are very fertile, producing grain, coffee, sugar, cocoa, arrow-root, tobacco and fruits; while on their fine pastures great quantities of cattle are reared to supply the needs of merchant-vessels.

The Sandwich Islands constitute a calling place (Honolulu) for the mail-steamers which ply between San Francisco, Japan and China. The inhabitants are of the pure Polynesian (Malay) type. Discovered by Captain Cook in 1778, they were erected into a constitutional monarchy in 1840.

Lying as they do in the middle of the Pacific Ocean, the Hawaiian Islands, though within the tropics, enjoy a fairly temperate climate. Rains, brought by the northeast trade wind, are frequent on the side of the mountains which faces that quarter, but on the other parts of the islands little rain falls, and the sky is generally cloudless. The yearly rainfall at Honolulu, being on the leeward side of Oahu, is under forty inches; that of the islands generally about fifty-four inches.

The soil, whose constituent parts are mainly scoriæ, decomposed lava and sand



THE GRAND MAUNA LOA IN ACTION.

is generally thin and poor, but at the bases of the mountains and in the valleys there are extensive tracks as fertile as they are beautiful. In Hawaii alone, on the Waimea plains, thousands of sheep of the merino breed find grazing ground; and on most of the islands, while the upland slopes of the mountains are clothed with dense forests, the lower levels spread into grassy plains rich with sugar and rice plantations.

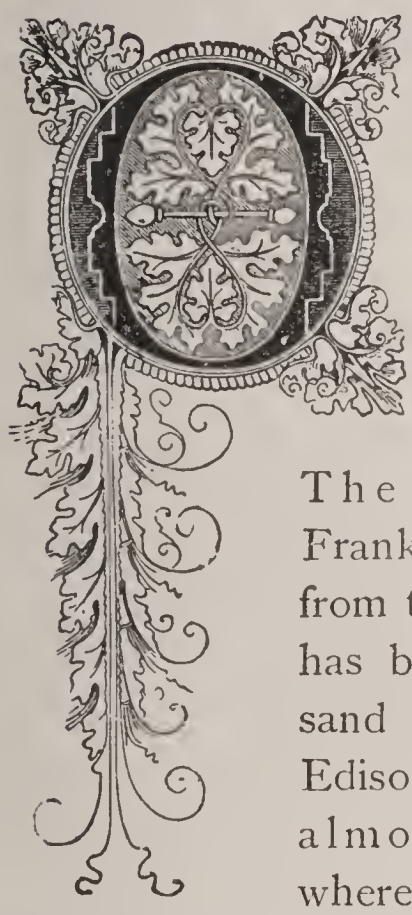
The islands are separated from other lands by a broad expanse and great depth of sea, consequently their natural history has many special features of its own. In the high mountains there are some species of plants akin to those of the American continent. The forest trees are mainly to be found on the windward, being the rainy side of the mountain ranges. Tropical fruits are numerous. There are now, as has been stated, numerous sugar and rice plantations on the islands.

The staple food of the natives consists of *poi*, a kind of thick paste made from the root of the taro plant and raw or dried fish. The only indigenous animals are rats, mice, bats, dogs and hogs, but others have been added since white men came to the islands; cattle, sheep, etc., having been introduced by Vancouver and other navigators. There are large numbers of semi-wild horses in the kingdom, and in some parts of the mountains wild dogs are also to be found.

Reptiles are few, including on land one species of the lizard and a few of the gecko; and the native birds, of which there are nineteen species, are rapidly disappearing, though foreign importations more than supply their place. The archipelago has unfortunately no mineral resources. Coral rock is the material chiefly used for building purposes, and to a less extent, basalt, compact lava and sandstone. There is a large variety of sea-shells, some of which are of exquisite beauty and loveliness.

ELECTRICITY

Latest Discoveries



IN late years the science of electricity has made strides so rapid as to surprise even those who are constantly looking for wonders in scientific discovery. The achievement of Ben Franklin in drawing lightning from the clouds with his kite has been surpassed a thousand fold. The triumphs of Edison, Bell and others read almost like miracles, and whereas it was once supposed that electricity was little else than a destructive force, it has now been caught, tamed, harnessed and made to work for the good of man.

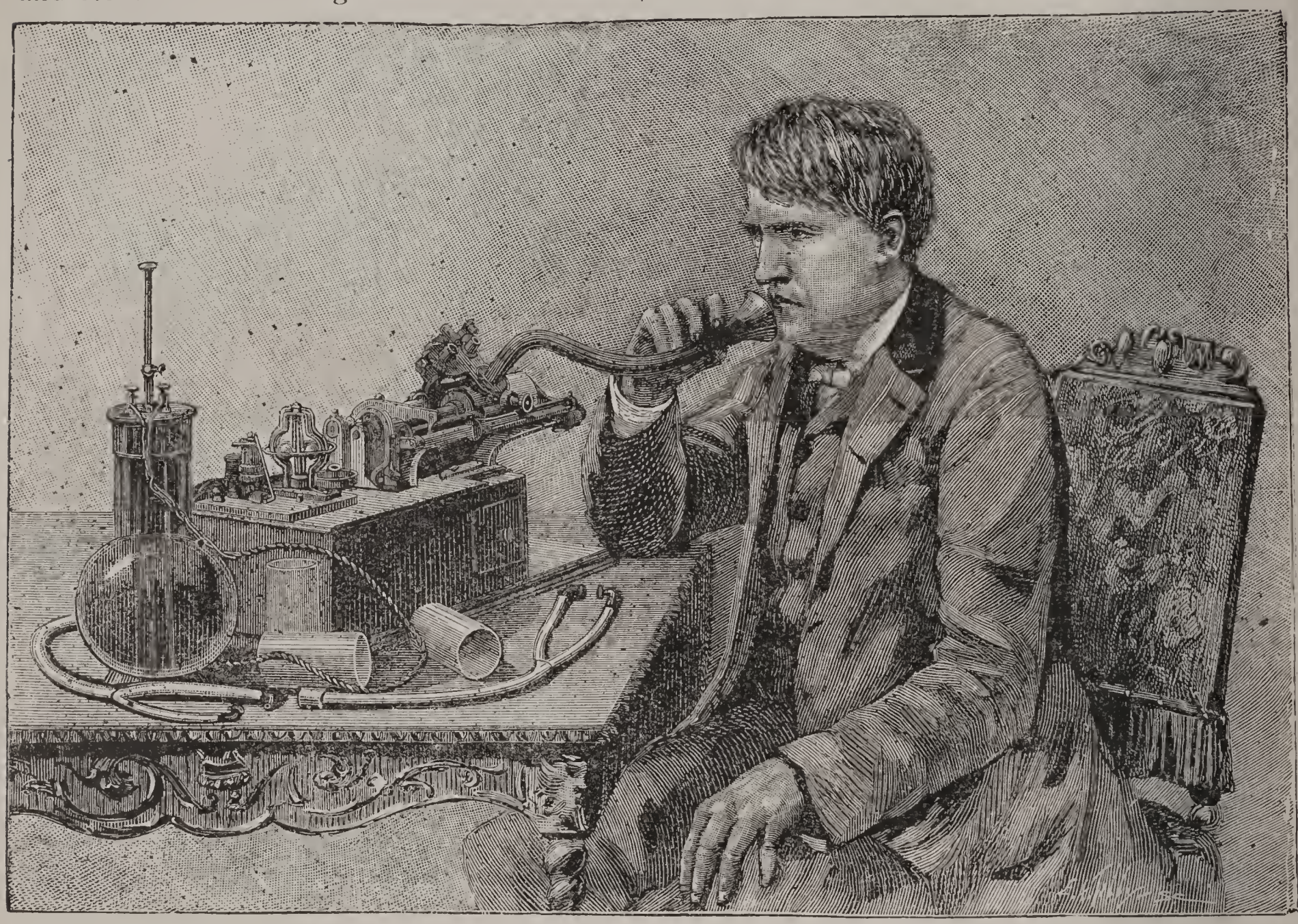
The electric light, illuminating the streets of every city; the telephone, repeating what you say here at a point miles distant; the phonograph, speaking, singing, reproducing sounds of every description; the kinetoscope, exhibiting the motions of actual life; the megaphone, sounding its trumpet blast far beyond the natural reach of the human voice; the application of the mysterious force of electricity to the uses of ordinary travel, such as street cars, and even railways hitherto operated by steam—these are only a few of the wonderful inventions and applications of the subtle agent which has suddenly leaped from the clouds and seems to be almost transforming the face of the earth.

If a stick of sealing-wax is rubbed vigorously with a woolen cloth, it will be found capable of attracting small shreds of paper. This is the simplest experiment in electricity. Many other substances, such as resin, vulcanite, glass, etc., can be made to show the same phenomenon. To obtain the best effect with any given substance a particular rubber must be chosen. For example, a cat's fur, slightly warmed, is every efficient in electrifying vulcanite or resin, while silk, amongst simple substances should be used to excite glass.

A Powerful Agent

Thus, in a simple manner, we discover in nature the existence of an invisible force. Its power may be said to be unlimited. It can shatter the stateliest granite column. It can rive in twain the brawniest oak. It can destroy instantly every form of animal life. Not until within a comparatively recent period has this force been mastered and made to work out beneficent results.

In a general way it may be said that in using electricity it is produced by friction, and stored as water might be in a tank and then the force is turned on when the power is required. All else relates to the construction of the necessary apparatus.



MR. EDISON TALKING INTO THE PHONOGRAPH.

The Phonograph

VERY few even of those who have heard the dulcet strains of some sweet song from the depths of the phonograph, understand in the least the mechanism by which the sounds are produced. The explanation is as follows: The phonograph is composed of a metal cylinder covered with a thin layer of wax, on which a pointed pen inscribes tracings, corresponding to the vibrations caught by a membrane placed on top of the pen.

The wax-coated cylinder is rapidly revolved by means of an electric battery, and as one speaks in front of the membrane, the cylinder advances slowly in a horizontal position, at the same time revolving rapidly.

The membrane vibrates much or little, according to the sounds emitted by the operator. The pen moves according to the vibrations, and peculiar, almost imperceptible tracings on the wax are the result. On top of the membrane is a funnel into which the operator speaks. The picture shows Mr. Edison talking into this funnel.

To obtain reproductions of the sounds as inscribed on the wax cylinder, it is replaced in its original position. Another pen of different construction than the first is put into play, and in a most exact and delicate manner transfers to the wax of another cylinder the tracings on the first. The funnel is replaced by a rubber tube having two, four or six branches, according to the number of the auditors, and the tubes are applied to their ears, as in the illustration.

LISTENING TO SOUNDS FROM THE PHONOGRAPH.

Not only can we hear the sounds from the same phonograph into which they are spoken, but the cylinders may be preserved and taken wherever we wish; by placing them again in a mechanism as above described, the original sounds may be reproduced.

In this manner are made the phonographs found in many hotels and public places. The first cylinder is carefully made as above described, and duplicated as many times as required. Each cylinder is then placed in a case, and the phonograph may be put in use when required.

The new and perfected Edison phonograph has already gone into very general use and many thousands are distributed in American business offices, where they facilitate correspondence in a variety of ways. They are also employed by stenographers as a help in the transcription of their shorthand notes. Heretofore these notes have been slowly dictated to amanuenses, but they are now frequently read off to a phonograph and then written out at leisure. The phonograph is, however, being used for direct stenographic work and it reported verbatim forty thousand

words of discussion at one presidential convention, the words being quietly repeated into the machine by the reporter as quickly as they were uttered by the various speakers. A large number of machines are in use by actors, clergymen, musicians, reciters and others, to improve their elocution and singing It is also worthy of note that voice records remain of distinguished men, who "being dead, yet speak."

Why the Wheels Go Round

FEW people understand the principle upon which street cars are propelled by what is known as the Trolley system. Most people know that a power-house, a trolley wire and a motor are necessary to the system, but of the functions of the various parts they have but a faint conception. "What makes the wheels go round" is a mystery, yet it can be easily explained.

First, there are boilers to generate steam for the engines, and the engines in turn drive the generators, which produce the mysterious power or "juice," as it is commonly called by the electricians, for the motors in the cars. It is obvious, therefore, that the prime factor in the operation of an electric railway is steam, the electric current acting only as a convenient and subtle agent for transmitting and distributing the power.

The voltage of an electric circuit corresponds to the pressure in water pipes. The voltage of a dynamo depends on three conditions, namely, the speed of revolution of the armature, the number of coils of wire in the armature, and the strength of the magnetic field. For incandescent lighting, 110 volts are generally used, while for railways the pressure is 500 volts.

The current from the generator in the power-house goes to the switchboard, where it passes through an ammeter, which indicates the amount of current being given out, through a switch, by means of which the current may be shut off at will, and through a circuit-breaker, which opens the circuit automatically in case of a short circuit on the line or an overload.

From this point one side of the circuit is composed of the feeder (heavy insulated copper cables) and the other side of the ground or return. Formerly the rails alone connected with the ground formed the return, but owing to various causes, among them the electrolytic action on water and gas pipes, the modern practice is to supplement the rails with heavy copper wires, which afford an easier path for the current than the pipes. The feeders run parallel with the tracks, either overhead or underground, as the case may be, and at points along the line are "tapped" or connected to the trolley wire.

How the Current is Applied.

Each car is provided with two motors, the armatures or revolving parts of which are connected to the axles of the cars. A motor is made almost exactly like a generator. In fact, if driven by an engine, it will generate an electric current the same as the generator. Therefore, when the power of the engine drives the armature of the generator in the power house, causing it to give out a current, this current supplied to the motor causes its armature to revolve and develop the same mechanical power originally required to drive the generator, eliminating, of

course, the various losses due to friction and leakage.

Next the current goes through the motor. While delivering a lecture before an audience of unskilled laymen, a well-known electrical engineer was asked how the current gets into the car, and he replied: "The conductor brings it in." Of course he meant the copper conductor running down the trolley pole, and not the innocent fare-taker and bell-ringer.

Practical Illustration.

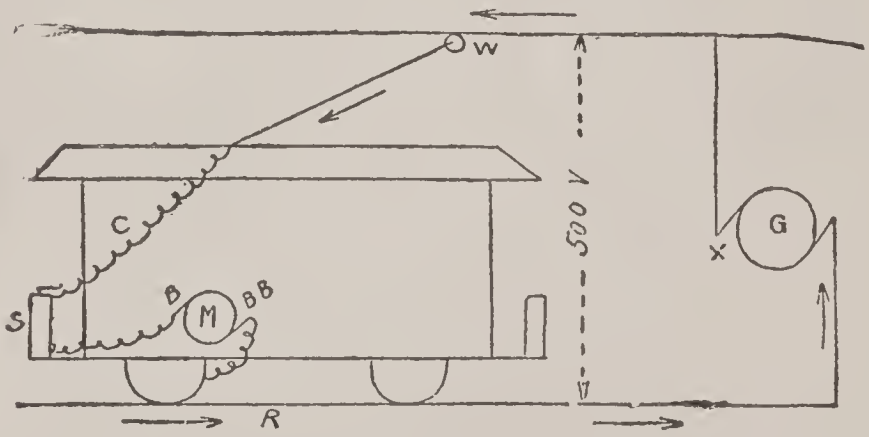
The method of allowing the current to pass through the motor in the car is illustrated in the annexed sketch. The top line is the trolley wire and R shows the rails. Between these there is maintained a pressure of 500 volts. W is the trolley wheel in contact with the trolley wire, and attached to the trolley pole. In electrical contact with the trolley wheel and running through the trolley pole is an insulated copper wire C. This wire is shown in the sketch, but is, of course, concealed in the car. It runs to the familiar metal case on the platform. This case contains the controller, which consists of a system of coils of wire, resistance arranged so that the speed of the motors may be varied by the motorman by turning the switch or controller handle to different points.

The controller is also so constructed that by turning another handle the motor will revolve in the opposite direction, backing the car. The coils are so arranged that the two motors may be thrown in parallel or in series, which means in the first case that each motor completes a circuit by itself, while in the second case the same current flows through both motors. Only one motor is shown in the sketch, which is sufficient to illustrate the principle

The direction of flow is shown by the arrow heads. The current from the generator G in the power house flows to the feeders and trolley wire. From the trolley wire it flows through the trolley wheel W, through the wire C in trolley pole to the controller S, where it is turned on or off by means of the controller handle. From here it flows through another wire to the brush B of the motor M, through the armature of the motor and out at the brush B B, then through a wire into the car wheel to the rail R, which carries the current back to the negative brush of the generator G.

Great Motive Power.

The flashing often seen at the wheels of an electric car is caused by imperfect contact between the wheel and rail, and is due often to dust on the rail or similar causes.



Already the electric current has been applied to ordinary railroad traffic. The most advanced thought on this subject points to the time not far distant when electricity will be the great motive power superseding steam. Its advantages are evident at a glance. The speed which it is capable of furnishing, the absence of annoying smoke, the facility with which it can be operated, all indicate that its practical results will be of great service, will form an epoch in scientific discovery and constitute a new mode of carrying on those great industries which are dependent upon a motive power, at once efficient and easily manipulated.

Successful efforts have been made to place the conducting wires in the earth, thus avoiding the danger of having them over head. The advantage of this is apparent, and being accomplished, we shall have the most complete motive power ever brought into use.

The achievements thus far in electrical science are among the greatest triumphs of the age. These have come rapidly and in vivid succession. The most acute thought and inventive genius have been displayed in the practical application of this greatest and most marvelous of all the agents treasured in the storehouse of nature.

The Telephone

SUPPOSE you want to communicate with your neighbor across the street: a wire is stretched between the two houses and connected to the two telephones; from the remaining binding screw of each telephone wires are conducted, say, to the gas-pipe, and the *bare* wire wound round the *bare* pipe, so that there may be metallic contact. Conversation may now be carried on as in the annexed figure. For short distances you will perhaps find least difficulty by using a double wire instead of connecting to the brass pipe, as the joints of the latter sometimes intercept altogether the flow of electricity.

COMMUNICATING BY TELEPHONE.

Philosophy of the Telephone.

We already know that when sound-waves impinge on anything like the ferrotype plate of a telephone, such a plate is made to vibrate; and a piece of iron like this vibrating in the neighborhood of a magnet will considerably disturb its lines of force. If these fluctuating lines of force, therefore, are crossed by rings of wire, currents of electricity will be generated in the wire.

And so it is every time one speaks into a telephone, for electricity is generated and sent along the wire to the other end, in a direction which varies with the "in-and-out" action of the telephone plate.

You will clearly see, then, that electricity is produced at the *transmitting* end. What happens where the listener has his attentive ear to the telephone? The electricity travels round the coil of the *receiving* telephone, and varies the magnetism of the bar within it, which in its turn varies its attraction upon the ferrotype plate; the ferrotype plate begins to vibrate, and it vibrates in such a way as to reproduce the sounds which were spoken into the transmitting end.

Transmission of Sound.

That we should ever be able to "talk by lightning" was not dreamed of for many years after the discovery of the telegraph proved that messages could be transmitted through motions of the electric instrument producing signs. Now we do not have to write the communication, but can speak to a person many miles away, and converse almost as freely as we would with one by our side in the same room.

The principle is that of the transmission of sound. The air, the water, woods, metals are all conductors, but it has been proved that a metallic conductor, a telegraphic wire, with electricity for the driving force, is the best transmitter ever discovered. The telephone has rapidly sprung into use, and has become a necessity in our large towns, where, on account of the pressure of business, time is money and moments count for as much as hours did once. A man of business can call up his neighbor, who is near or his customer miles away, and in a brief time the matter in hand is disposed of.

The description of the instrument is as follows: An electro-magnet or spool of copper wire is fastened to the end of a steel bar which has been charged with magnetism; the ends of the wire are carried down to the outer part of the rubber case, and connected by screws to the line wire.

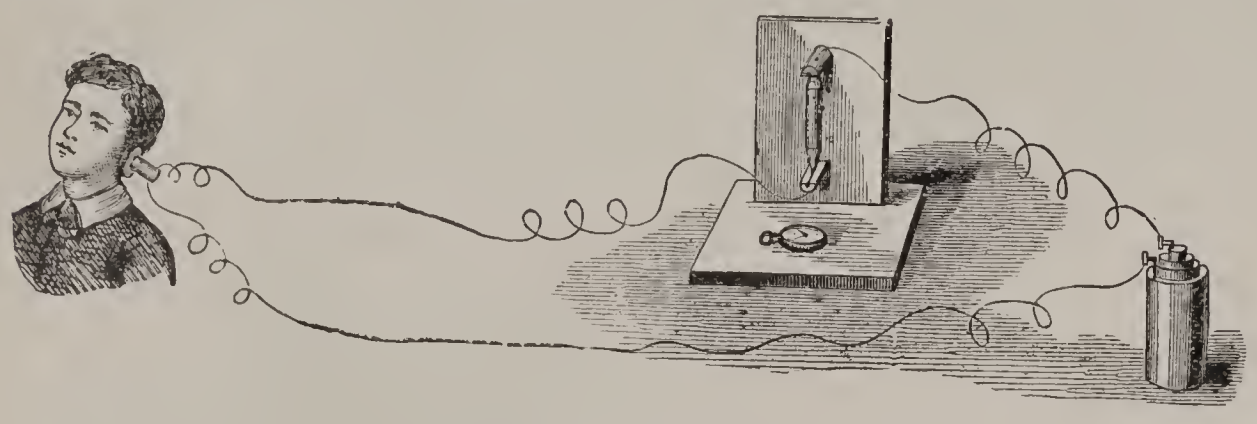
In front of the spool, and a little way from the end of the bar magnet, a piece of "ferrotype" sheet iron is placed. When a

THE BELL TELEPHONE.

current of electricity is sent into the telephone and through the spool of wire, thn sheet iron plate is caused to vibrate in unisoe with the breaking of the current, by reason of the alternate attractions and cessations of attraction of the plate by the electro-magnet, and a sound is produced, as already explained.

The microphone is an instrument for intensifying and making audible very feeble

sounds. It produces its effects by the changes of intensity in an electric current, occasioned by variations in the contact resistance of conducting bodies. It has always been known that many solids are excellent conductors of sound. One of the little experiments of boyhood is for one lad to hold his head under water while another, not far away, strikes two stones together under the surface. The water coming in close contact with the ear, and being a good conductor of sound, produces something in the nature of a shock, quite as startling as would be the firing of a pistol near one's head. This, it must be understood, is not the principle of the microphone or telephone. There must be a conductor for the electric current, but the current itself is indispensable.



THE MICROPHONE.

Thus, not only by the telegraph can words be transmitted, but also in a more direct way, and even the tones of the human voice can be distinguished. It is literally true that we talk by lightning, and can speak to a listener a thousand miles away. Our age finds in electricity its most marvelous field of discovery.

The Electric Light

THE problem, long-studied by scientists, of procuring from this subtle force in nature a light that would be of service and outstrip all other means of illumination has been solved, and in every town now, of any dimensions, electric lighting is in successful operation.

Pure incandescence is represented by four systems—Edison, Maxim, Swan and Lane Fox. The light from this description of lamp is from the heating of a carbon filament due to its high resistance to the passage of the current. This filament is surrounded by a hermetically sealed glass bulb from which all the air has been extracted.

The life of the lamp depends greatly as to how carefully this process has been carried on. It is not sufficient only to extract the air when the lamp is cold, but the process must be carried on when the lamp is burning, and the exhaustion must be continuous for some time. These lamps can be worked either by an alternating or a continuous current machine; and, unlike those of partial incandescence, require a tension current, while the former work best with a quantity one.

The Edison lamp is generally considered to be the pioneer of this system of illumination. Whether this be so or not the name of the inventor has been for a considerable time associated with lighting by incandescence, although his early experiments were with a lamp containing a metallic substance. The lamp consists of a blown glass globe containing a very fine filament made from the fibre of bamboo carbonized. The length is fixed according to the resistance required.

Each end of the filament is nipped between a miniature vise composed of platinum

connected with the terminals of the lamp. These are fixed in an insulated socket, which also holds the glass bulb. The socket is furnished with a screw which fits into a projection on the bracket or holder, so that the act of screwing in the lamp makes the necessary connection with the conducting wires.

By turning a tap the lamp can be removed without interrupting the passage of the current. The maximum duration of the lamp is stated to be twelve hundred hours. The chief feature of the Edison system is the manner in which the inventor distributes the current from a main generator of his own design, which is always used with this system of lighting.

THE VOLTAIC ARC.

The engraving on next page is a perfect representation of Edison's latest electric lamp, with its various parts shown in detail. Fig. 1 shows the carbon horseshoe ready for use, full size; Fig. 2 represents the horseshoe when just cut from the Bristol board, illustrating, by its comparison with Fig. 1, the enormous shrinkage it undergoes during the process of carbonization.

The only index to the completion of this process is the crackling of the oxide formed on the exterior of the iron boxes in which the horseshoes are placed. After their removal from the boxes the carbons are placed between the jaws of small platinum vises, *a*, *a*, supported on thin platinum wires blown in the glass base and forming the electrodes. The resistance of the slender horseshoe is one hundred ohms.; and while the lamp shown, Fig. 3, is intended to give a light equivalent to a single four-foot gas jet, it may be forced to give a light equal to eight or ten of such jets.

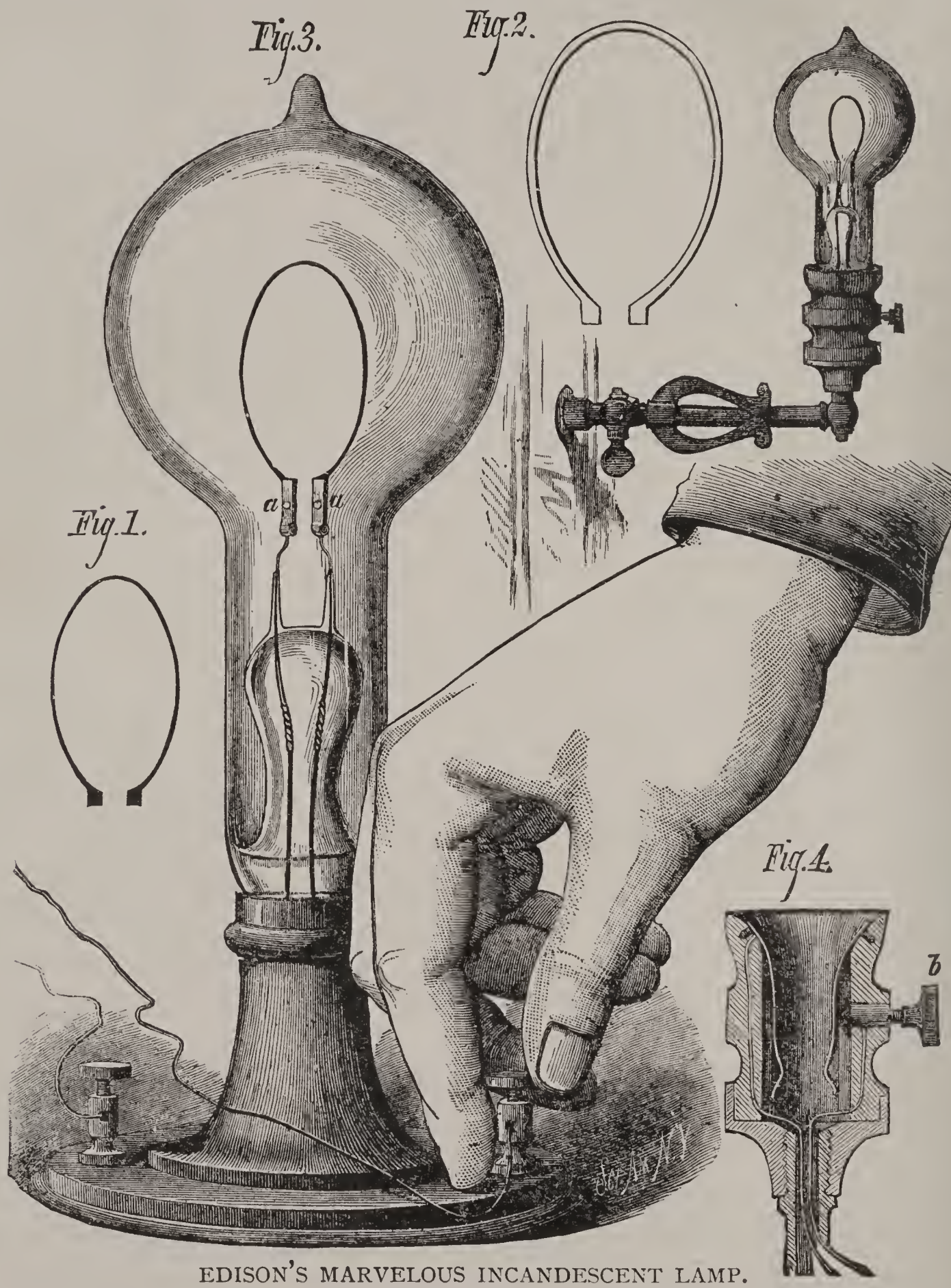
The carbons are so tough that one of them has been subjected to the test of applying and removing the electric current a number of times equivalent to thirty-six years of actual daily use, and without being in the least impaired. The horseshoe form of the carbon has a great advantage over the voltaic arc, the light being softer, more diffused and less trying to the eyes. It is, besides, perfectly uniform and steady. The lamps are connected in multiple arc, that is, the two wires leading from the electrical generator run parallel to each other, and the lamps are placed between them and are connected with each wire.

Easily Handled.

The entire lighting apparatus of any building consists in the lamps and a few wires. The lamp in its present form is as simple and as easily handled as a candle, and can be taken from its socket and replaced even while the current is on. The construction of this socket is shown in Fig. 4. The lamp has, attached to its electrodes, slips of copper which are bent up against the sides of the glass, touching two springs at opposite sides of the socket. One of these springs is connected with one of the electrical conductors; the other merely touches the copper strip, and does not form a part of the electrical conductor until it is touched by the thumb-screw, *b*, this latter being connected with the second electrical conducting wire.

To start the light it is only necessary to turn the screw, *b*, till it touches the spring. To stop the light the screw is turned in the reverse direction. From this it is obvious that an electric lamp is more easily managed

than a gas burner, as it requires neither lighting nor regulating; while it is equally plain that these lamps, having withstood the test of time, the inventor has solved a pro-



EDISON'S MARVELOUS INCANDESCENT LAMP.

found problem, and become one of the world's great benefactors.

Edison's Mimeograph.

The Mimeograph was designed and patented by Mr. Thomas A. Edison. In designing the mimeograph, Mr. Edison took as his fundamental principle the stylus or point, the writing implement of man since the art was first invented. It is the natural tool by which the hand can trace characters and it is this stylus or point, peculiar to the mimeograph in the line of duplicating machines, which created for it such a decided and permanent popularity.

With the stylus as first principle, Mr.

Edison built the mimeograph, with reference to the stylus as the writing instrument, designing the other parts to meet its requirements.

The mimeograph belongs to the stencil class of duplicating machines, which, as is well known, is the best type of such devices. The stencil is made on a sheet of fine specially manufactured tissue paper, which is coated on one side with a film of sensitive material.

Fine Steel Plate.

The cutting agent of the mimeograph is a plate of fine tool steel, upon which are cut intersecting corrugations, numbering two hundred to the inch, thus making on the plate a surface of small sharp points, so fine and minute that a magnifying glass is required to bring them distinctly to the eye; upon this steel plate, which is imbedded in a table or plate of polished slate, the sheet of sensitive paper is placed, and the stencil is formed by writing on the paper over the steel plate with the stylus, which is made of tempered steel and nickel plated.

As the steel point of the stylus (which is ground to a round or smooth point) passes over the sensitive paper, it presses the paper against and upon the steel plate, and the fine sharp points puncture it from the under side making a series of orifices or holes, each one a two-hundredth part of an inch from the next, in the lines of the writing.

The point of the stylus, although tapered to the size of a nicely sharpened lead pencil, really rests on three of the cutting points of the writing plate (as the corrugated steel is termed) at one time.

It thus glides easily and smoothly over the roughened surface without tearing the paper, but still with just enough friction to make the act of writing a pleasant operation almost identical to that done by a medium hard lead pencil.

After the stencil is made, the next operation is to prepare the stencil sheet (as the sensitive paper is now called) for the purpose of printing copies of which it is the original.

The ink is squeezed from its collapsible tube upon a slate used for that purpose, and a hand roller made of a peculiar composition is passed over it, spreading the ink evenly over the slate, and at the same time charging the roller.

The sheet of paper upon which the copy is to be printed, is placed upon a blotter resting on the baseboard beneath the stencil sheet, and the ink roller is passed over the stencil sheet, forcing the ink through the perforations and upon the impression paper, thus making a print. This last operation is repeated until the required number of copies are obtained.

The *modus operandi* just described is for the purpose of reduplicating autographic matter.

Edison's Kinetoscope.

Perhaps the simplest statement of the principle upon which this instrument is constructed, would be to call it the reproduction of motion. The observer looks through a glass into a small cabinet and appears to see living figures. These may be men, or animals, and they are in action. Just as the phonograph makes a faithful record of sounds, so the kinetoscope gives us a reproduction of the actions of living creatures.

The following is what Mr. Edison himself says on the subject: "In the year 1887 the idea occurred to me that it was possible to devise an instrument which should do for the eye what the phonograph does for the ear, and that by a combination of the two all motion and sound could be recorded and

reproduced simultaneously. This idea, the germ of which came from the little toy called the zoetrope, and the work of Muybridge, Marie and others, has now been accomplished, so that every change of facial expression can be recorded and reproduced life size. The kinetoscope is only a small model illustrating the present stage of progress, but with each succeeding month new possibilities are brought into view.

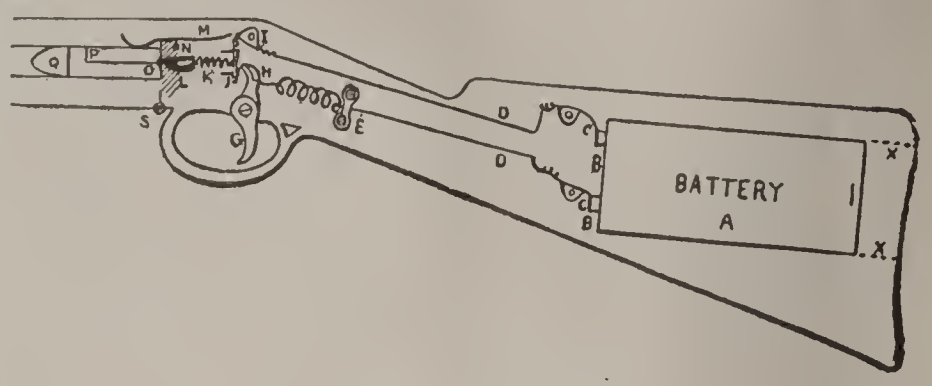
'I believe that in coming years by my own work and that of others, who will doubtless enter the field, grand opera can be given at the Metropolitan Opera House at New York, without any material change from the original, and with artists and musicians long since dead."

After the instrument was perfected the succession of pictures was found to be rapid, and those instruments exhibited in nearly all our towns are found to work most satisfactorily.

Electric Rifles.

The practice of firing big guns by electricity is already well established, but hitherto no practical attempt has been made to explode the shells of small arms electrically. An electric rifle has been designed in which it is sought to carry out this principle.

The source of the current is a battery A, which is fitted into the stock either from the side or from the ends. The holes B B are connected to springs C C, from which the wires D D run respectively to a spring M, bolted at I to the lock plate, and to the insulated hammer H fixed on the upper part of the trigger G. Q is the shell containing an insulated pin, the head of which O projects beyond the base of the shell. If necessary, two pins can be placed parallel with each other and insulated until their points nearly meet. Between the base of the cartridge and the hammer is a pin K encircled by a spring and riveted into a cross plate J at one end, the other end being fitted into an insulated thimble L, the point of which



ELECTRIC RIFLE.

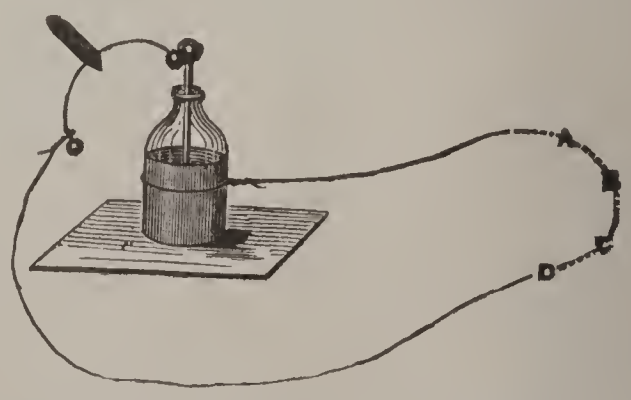
nearly touches the shell pin head O. When the cartridge has been inserted and the gun closed, the spring M rests on the metal base of the cartridge.

As the trigger is pulled, the hammer strikes the plate J forcing the point of the thimble L into contact with the projecting end O of the cartridge pin. An arc is established at P O, which explodes the contents of the cartridge.

The point of the firing pin P can be placed anywhere within the explosive powder of the cartridge, but by extending it near the bullet, as shown in the illustration, a more effective explosion of the powder is secured.

To Get an Electric Shock.

Suppose there are four persons (A, B, C and D) who are desirous of receiving the shock. A wire is wound round the outer



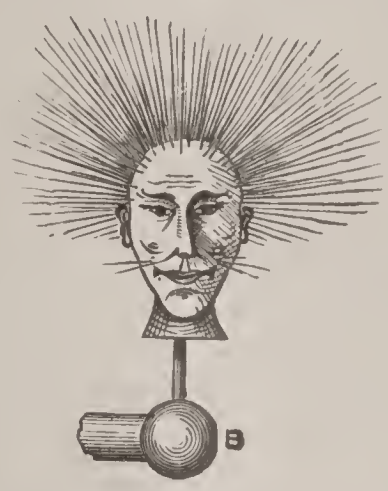
GIVING A SHOCK TO PEOPLE.

coating of the Leyden jar; the jar is then charged and placed on the table. The four persons join hands, and while A holds the

end of the wire leading from the outer coating of the jar, D has also hold of a wire which is in communication with one of the knobs of a discharger. You now seize the insulating handle of the discharger and bring *one* knob only in contact with the knob of the Leyden jar. A shock will be experienced by the four persons, and unless A be cautioned he may, by his sudden antics, pull the jar off the table.

A Singular Effect.

There are many effects, some of them odd and humorous, which can be produced by electricity. For example, place the figure of a human head, with flowing hair, on the



AN ELECTRICAL FRIGHT.

end of a rod stuck into the prime conductor. Immediately it becomes charged with electricity its hair stands on end as if it had received a terrible fright.

How Ocean Cables Are Made.

The cable consists first of a core comprising the conductor made of a strand of copper wires, and the insulating covering of gutta percha or India rubber to prevent leakage of the electric current. Outside of this is a layer of tanned jute yarn. This protects the gutta percha or rubber from the sheathing of steel wires which is the next covering, and which varies according to the depth of water in which the cable is to be laid. Outside of this again is a combination of jute yarn and a bituminous mixture. This is applied in a melted condition from a spout as the cable is passed underneath. During the time the cable is being manufactured and laid, electrical tests are taken to insure perfection.

The finished cable is then kept coiled in large circular iron tanks under water. Similar tanks are in the cable ship, and when at sea the lengths are paid out over a large pulley at the stern. The speed is regulated by several retarding wheels and a brake wheel, over and under which the cable has to pass. The strain to which it is subjected at any given moment is indicated by a dynamometer.

Method of Laying.

When all the cable has been paid out, the end is carefully sealed up and attached to a stout rope. This is lowered to the bottom of the sea and the other end of the rope is attached to a buoy which is to mark the end of the cable, which is usually laid in three sections. One laid, for instance, was started from Waterville and laid out to a given point in deep water. The second section was laid from Canso, on the American side, also into deep water, after which the fifteen hundred intervening miles were laid and all three spliced together.

But the laying of a cable is as nothing to the difficulty experienced in repairing it, especially if the work has to be done during rough weather, when the sea runs mountains high and the gales continually blow the ship away from the scene of operations. Sometimes the cable is found buried in sand several thousand fathoms from the surface of the water. When it is only a flaw and the strands themselves are whole the task of repairing it is slight; but when the cable has actually parted and both ends have to be found and again spliced together, it is sometimes a work of several months.

Famous Gems

A ROYAL gift is now in the hands of the Pope of Rome. It is a diamond, the size of which has never been equalled in the whole world, unless the story of the Braganza diamond was true. That diamond, it was said, weighed in the rough 1680 carats. The loss in cutting generally comes to one-half or a little less than two-thirds. This would make the gem weigh about 560 carats when cut. The stone was said to be worth £3,000,000 sterling or $15,000,000. What became of the Braganza is not known. It is probably now famous after successive cuttings and various owners under a name which has no association with the original finder.

Very little is yet known of the immense diamond now the property of the Pope. The meagre cable despatches from Rome said that it was found by an African chief in the mines at Jagersfontein, and is said to be the largest known, weighing in the rough 971 carats. It came into the possession of the President of the Transvaal Republic, who sent it to the Pope. It is described as being of a bluish white cast and practically perfect, the only blemish being a tiny spot, invisible to the naked eye.

What the value of this stone is can hardly be estimated. When cut the weight of the stone will be about 450 carats, and, if perfect, it should be worth the gigantic sum of $20,000,000. Large South African diamonds have not the same value that the Brazilian stones have. An eighty-carat gem is a common find in the African mines, but most of the large stones discovered there are yellow in color, which largely depreciates the value. Still, from its gigantic size, the Pope's diamond has at once taken a foremost place among the great gems of the world, and two thousand years from now it will probably be talked and written about just as the Koh-i-noor is to-day.

The Queen of Jewels.

The most valuable cut stone in the world is the King of Portugal's Brazil diamond, which weighs 525 carats and is worth, if genuine, the magnificent sum of $28,000,000.

The Koh-i-noor or mountain of light owned by Queen Victoria, is worth $3,500,000. This brilliant is 2000 years old. The Hindoos trace it back to the time of the god Krischna. It was certainly in the treasury of Delhi, and was taken in the conquest of

that city by Ala-ed-Din. From him it came into the possession of the Sultan Baber, of the Mogul dynasty, in 1526. This prince esteemed its worth at the sum which it would take to maintain the whole world for a single day. The jewel was seen by Tavernier among the jewels of Aurengzebe, but it had been reduced by the unskillful cutting of Hortensio Borgio from 793 carats to 186, the weight it possessed at the Paris Exhibition of 1851.

The Emperor Indignant.

The Emperor Aurengzebe not only refused to pay Borgio for the cutting, so incensed was he at the great loss, but he confiscated all of his property, and was with great difficulty prevented from cutting off his head.

Nadir Shah, the conqueror of India, possessed himself of the stone by a trick; then it passed from his descendants into the possession of Achmed Shah, whose son, Shah Sujah, was forced, in his turn, to give the prize to Runjeet Singh. After the capture of Lahore, at the time of the Sikh mutiny, it fell into the hands of the British troops, who presented it to Queen Victoria in 1850.

The brilliant had an irregular form, with several hollows at the base and at the sides, and there were several fissures on the surface. After great discussion among scientists the stone was intrusted to Mr. Costen, of Amsterdam, for recutting, and the results were marvelous. Little was lost in size comparatively, and, instead of being a lusterless mass little better than a piece of rock crystal, it is now a matchless, fire-flashing brilliant weighing 10 1-16 carats, and forms a valuable part of the crown jewels of England.

One of the diamond wonders of the world is the Orloff, which is set in the scepter of the Czars of Russia. It weighs 194¼ carats. Like the Koh-i-noor it has the under side flat and is rose cut. The diamond is supposed to have formed one of the eyes of an idol in a Brahmin temple. It is also said to have been set in the famous peacock throne of Nadir Shah.

Be its origin what it may, it is certain that it was stolen by a Frenchman, who sold it in Malabar for £28,000. It was purchased by the Armenian Schaffras, who, in turn, sold it in the year 1774 to the Empress Catharine II. of Russia for 450,000 roubles, a pension of 20,000 roubles and a patent of nobility. Another beautiful diamond belonging among the Russian crown jewels is the Shah, which weighs 86 carats and is absolutely perfect, a mass of fire and brilliancy. It was presented to the Emperor of Russia by Cosroes, the son of Abbas Mirza.

Famous French Gem.

Among the other famous diamonds is the Regent or Pitt diamond, which forms part of the French crown jewels. Its weight is 136¾ carats, and its estimated worth to-day is $1,000,000. It was bought by the Duke of Orleans, then Regent of France, of Pitt, the Governor of Fort George, in the year 1717, for £135,000, in the rough stone weighing 410 carats, and the cutting cost £2000. Pitt published a pamphlet declaring that he purchased the stone in Golconda of Jamelchund, a Hindo merchant. This diamond was stolen from the Garde Meuble in 1792, but was mysteriously restored. Its final cutting occupied two years and cost £3500.

The Emperor Napoleon I. had it set in the hilt of his sword of state, and it was captured by the Prussians at Waterloo. This wonderful stone was shown at the French Exhibition in 1855.

The Empress Eugenie has a superb stone, absolutely perfect, which weighs 51 carats; it is set as a pendant, and was purchased for her by Napoleon III.

The Florentine belongs to the Emperor of Austria; it weighs 139½ carats, and it is worth $500,000. It is yellowish in color and is rather thickly covered with facets like a rose diamond. In shape it is pointed top and bottom.

Disappeared and Returned.

The noted Sancy diamond is almond-shaped; it weighs 53½ carats; it was found on the body of the Duke of Burgundy in 1479 and was bought by the King of Portugal. After many changes it finally came to James II. of England, who sold it to Louis XIV. for £25,000. It disappeared, with many other valuable things, in the dark days of the Revolution, and some years later became by purchase the property of Prince Paul Demidoff.

After the battle of Culloden the city of London purchased a magnificent diamond at a cost of $57,000 and presented it to the Duke of Cumberland. It was known thereafter as the Cumberland diamond; its weight is 32 carats. It was one of the the stones claimed by the crown of Holland.

There are perhaps 8,000 dealers in diamonds in the world who carry in their stock stones worth perhaps $350,000,000. The remainder are in the hands of private individuals. There is always something fascinating about the subject of diamonds, and rich and poor like to read about precious stones. It is estimated that during the last twenty-five years the American people have paid duty on at least $180,000,000 worth of diamonds and other precious stones. In 1893 alone they imported $15,203,563 worth, but in 1894 there was a falling off, owing to the hard times, and the total was only $4,856,895. This does not include uncut diamonds, of which we imported more than 1,000,000 worth in 1892, $800,000 worth in 1893, and $566,267 worth in 1894.

Diamond-Cutting.

In 1880 we imported only $129,000 worth of uncut diamonds, and in 1889 only $250,000 worth. The large increase of late has been due to the fact that a number of American jewelers have opened diamond-cutting establishments. There are now fifteen establishments in the United States, which employ from one to twenty men. There are 4,000 manufacturers in Europe and about 200 in the United States, who employ between 7,000 and 8,000 persons as cutters and polishers.

Perhaps 28,000 people are employed in the diamond mines throughout the world. We read that in past centuries 60,000 people were working in some single Indian mines at one time, and perhaps that statement is not exaggerated, since by the aid of modern machinery one miner can now accomplish as much as twenty who use the primitive methods. The total value of all the diamonds in the world undoubtedly exceeds $1,000,000,000.

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